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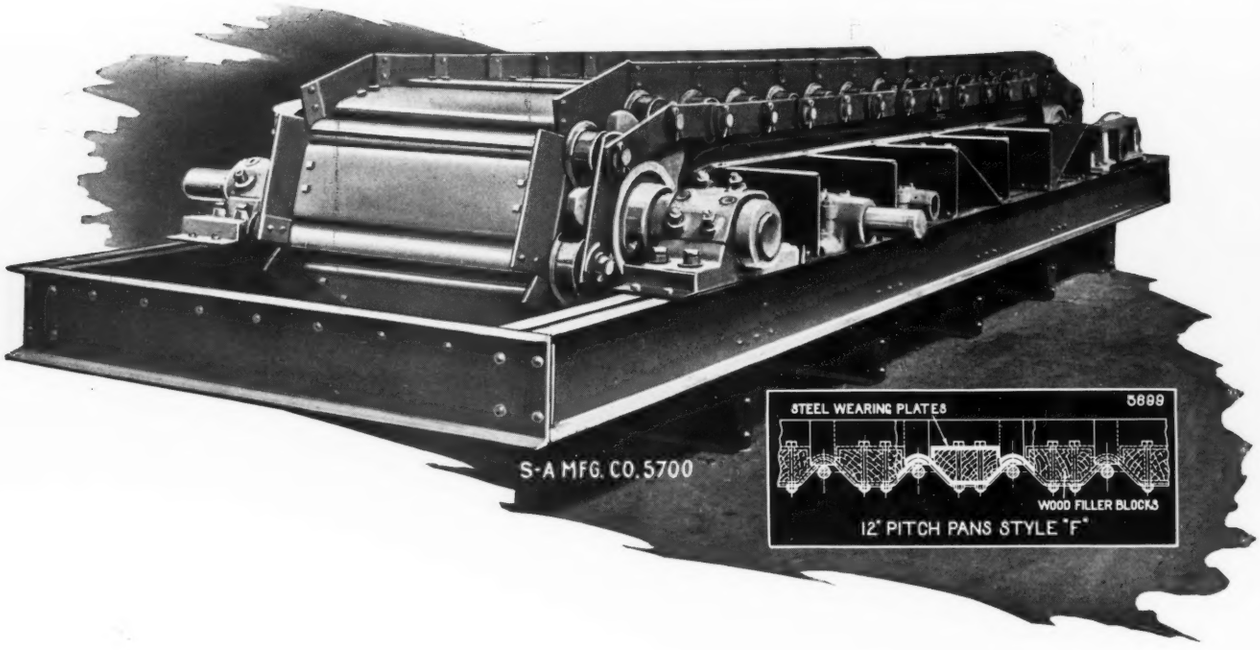
A WEEKLY JOURNAL REPRESENTING THE WORLD'S MINING AND METAL INDUSTRIES

March 10, 1923



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ENGINEERING & MINING
JOURNAL-PRESS
JOSIAH EDWARD SPURR, Editor

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The Responsibility of Engineers to Clients

AN ENGLISH MINING ENGINEER, Mr. H. C. Embleton, made a report in 1914, on a certain coal property in the South of France, for a firm of financiers in London, Abram & Smith. In this report Mr. Embleton stated that certain development work just finished demonstrated the continuity and thickness of the principal coal seam of the property. "These explorations show the thickness of the No. 1 seam to be maintained at 6 ft. 6 in., and the work carried out has proved the existence in the Gages area alone of some ten million tons of coal." As an engineer's fee for the report Messrs. Abram & Smith gave Mr. Embleton a promissory note for £2,000 payable in 1918.

When the coal was worked, however, the tonnage estimated was found not to be there; in fact, the actual tonnage was relatively insignificant. Messrs. Abram & Smith thereupon refused to pay the principal and interest of the promissory note which they had given—refused, in effect, to pay the engineer his agreed fee—on the grounds that the statements in the report were false and the report therefore was fraudulent; and they furthermore filed a cross-suit claiming damages for alleged fraudulent representations.

Both the primary court and the court of appeal, however, have just ruled in favor of the claims of the mining engineer and against those of his clients. The courts found that the statements in the report had been found to be untrue, as the clients claimed; but they declined to find the engineer guilty of fraud. The fact that the engineer had invested some of his own money in the enterprise, which was presented as evidence by the engineer's counsel, the court held to be extraneous evidence. The judge stated that in his opinion, given indications of the existence of coal in a given area and the honest belief that the indication amounted to proof, he did not think that a person holding that belief could be convicted of fraud for stating that coal could be proved in the area even though it did not exist there.

It is difficult to see how any other conclusion could be logically reached than that handed down by the courts. A professional advisor gives upon any problem upon which he is consulted the best that is in him, and charges a flat professional fee for his advice. The "no cure, no pay" plan, rightly or wrongly, is little in vogue, either with physicians or engineers. We know of cases where clients have made millions out of the report of an engineer, for which he received a flat and very small fee. He had in this case no moral or legal grounds for claiming a generous share of these millions: and, conversely, if the advice in his report had proved erroneous and his statements of facts unfounded, his clients would have had no moral or legal ground to sue for a recovery of their fees, or to recover damages. The element of risk of mining, as indeed in other business enterprises, is generally recognized: and the seasoned operator does not complain if events prove that the advice of the engineer has not been all-wise, or even if it has been foolish. The surgeon who advises an operation on a sick man, and performs it with fatal results, is not liable to a suit for damages. His fee is the same whether the patient dies under the knife or has his life lengthened threefold.

Indeed, the courts, in commenting on this case, pointed out that the claim of the clients would involve the very principle that the reports of engineers should be paid according to the results, and made clear their disapproval of this principle.

"I venture to say," said the judge, "that it is a very dangerous state of mind for a mining engineer to be in whose optimism is directed to helping his employers to raise money, and it is an especially dangerous state of mind when his remuneration depends directly on the state of his optimism."

Here is a principle which is worth pondering. We do not like to see the names of prominent engineers and geologists attached to a stock offering, unless at the same time the full report of these engineers is also made public and unless the psychological emphasis of the suggestion to the public to buy is strenuously focused on the report and not on the name and standing of the engineer.

Copper Dividends

A QUICK RESULT of the recent rise in the price of copper is the payment of dividends by some of the largest copper companies. The declaration of the original dividend by the Chile Copper Company a few weeks ago came earlier than expected. This marks the complete stage of a magnificent mining enterprise, brilliantly planned, and carried out with the utmost patience, skill, and foresight. Chile Copper, Utah Copper, and Ajo stand out perhaps as the three great triumphs of the science of mining, metallurgy, and mine management.

Next in the order of dividend paying comes Anaconda, with a resumption of dividends, on a basis of $3 a year, as against the $4 rate when dividend payments were stopped in 1920.

The spectacular rise in the price of copper has of course been due partly to the demand for domestic consumption. The electrical industry, especially, is expanding as fast as it can provide the mechanism. The building industries are also active and absorbing much metal. The foreign demand is not strong, but is by no means discouraging.

The numerous consolidations that have taken place in the copper-mining and copper-manufacturing industries during the year have had a beneficial effect upon the market not to be measured in quotations but in the community of interest established between miner and user of copper. The world's foremost producing company—Anaconda—has become actively concerned with problems of popularizing and distributing copper and

brass products, work which has been eased by the low price that has obtained for copper during the last year or so. The reorganizations which have occurred and the drastic medicine the industry gave itself by shutting down operations not so many months ago have at last taken effect.

Ore in Sight

A CORRESPONDENT, whose letter we print on p. 438, raises the old question as to the terms to be employed in estimating ore reserves in a mine. He very logically objects to limiting the phrase "ore in sight" to ore blocked out on all sides, arguing that if you can see ore, it is ore in sight, and that just because it is only shown on one or two sides it is illogical for an engineer to report that there is no "ore in sight." Of course, what the engineer means is that there is no *computable tonnage* of ore in sight; but the usage is misleading.

Indeed, those who have studied and practiced the science of ore estimation long will hardly fail to agree that the only sure tonnage of ore, the only "positive" ore "in sight," is at the stage when it is in the mill bins. Until it is broken down, sampled, and weighed out, any and all estimates of value and tonnage are, *at the best*, approximations, which vary as to their accuracy according to the conditions and, above all, according to the intelligence and background of knowledge of the engineer investigator.

The personal factor in arriving at the approximate statement of ore reserves is everything. The mathematical formulas are simple, and if carried to complication, or leaned upon as safeguards, unreliable and misleading. We have seen ore exposed on all four sides, as required by the definition "ore in sight" or "positive" ore; it was "in sight" on all four sides; and yet the block of ore was not there. The drifts on all four sides had been driven on barely detectable fissures in the rock, from which fissures the mineralization faded away in intensity. The further you went away from all four sides, the less the value, the more barren the rock.

The best mathematical formula for estimating ore, the one which we recommend, is simplicity itself. Reduce your cubic feet, after you have measured the block you want to estimate, to cubic meters, and multiply by the specific gravity of the ore to get your metric tons; then, if you do not want metric tons, convert back to English tons. This method is not only the simplest, but is the only accurate one. A cubic meter of water weighs a metric ton, and the specific gravity of any mass is its ratio to an equal volume of water; hence the formula. This method puts you up against the definite question as to how much your ore weighs, and this is an important question, for it may be all quartz or it may be all galena. It is shocking to think that the average "engineer" guesses at the weight of his ore, and, when it comes to this one of the major factors in his estimation, says, "Oh, we'll allow eleven cubic feet to the ton"; allowing himself a wild guess and then weaving that guess into his elaborate calculations.

But the mathematical formula is of minor importance compared with the factor of intelligence and the background of knowledge of the investigator. On this he must rely for the best visualization of how the ore will lie, back of the faces exposed. Ore is not like coal; it is irregular and whimsical to the highest degree. One must take into consideration the history and even the psychology of the development work and of the man who did it; and on what plan or theory he did it. One must know all that is to be known as to the laws and behavior of ore deposits under the conditions which he finds in the problem under his hand. And in this way much avoidable error can be eliminated.

It is a fact that the average estimate of ore reserves is primitive. It is a fact that prominent engineers, examining a mine, differ widely in their results and often quite unwarrantably, for their differences are due to the sloppy way in which the average examination is made. Careless sampling, insufficient checks on assaying, guesses at specific gravity, ignorance of the habits of orebodies are often exhibited in a report to which is attached the name of a well-known engineer.

All of these things can be improved, and many a consequent disappointment avoided. The choice of terms is immaterial, and complicated formulas are usually misleading. The great thing is the maximum of accuracy, knowledge, and, above all, common sense.

Secretary Work

THE APPOINTMENT has been announced of Dr. Hubert Work, of Colorado, who has been serving in the cabinet as Postmaster-General, to be Secretary of the Interior. The appointment was offered to Secretary Hoover, but he preferred to stick to his guns in the Department of Commerce.

Concerning Secretary Fall, who gave place to the new Secretary last Monday, the conservative New York *Tribune* remarks editorially that "he did not make a Secretary of the Interior acceptable to the country as a whole. His departure will relieve a certain amount of real apprehension due not to his general qualifications as a public man, but to his local environment."

The new Secretary takes up the work without any very striking background of public service or indeed of private career. What is reported of him gives grounds for hope of a satisfactory administration. He is a Westerner, an excellent quality in a Secretary of the Interior. He will find plenty of room for activity in his new responsibility.

Danger to Gold-Dredging Industry in California

CALIFORNIA is in the throes of another session of its Legislature. These cyclonic disturbances occur at intervals of two years, and while industrialists are tempted to retreat into their "cellars" and let the storm blow itself out, they suppress this natural desire and endeavor to brace up their structures, lock their treasuries, and in a more or less organized fashion try to minimize the damage to as great an extent as possible.

The present session is similar to others. The usual number of tinkerers and meddlers has concentrated on the workmen's compensation laws, which are working well enough and which cost $9,671,462 for compensation, insurance, and safety, during the biennium ending June 30, 1922. Our appraisal of the new laws offered at this Legislature on this subject is that few are of importance. A "collar-to-collar" law for the special edification of the mining industry is among the old "properties" dusted up and presented to the law machinery of the state. It is illogical and discriminates against the min-

ing industry as compared to other industries. Mining should be free from restrictions of this kind.

Two bills, both covering the same subject (Senate Bill No. 454 and Assembly Bill No. 1,253) are especially objectionable. Both are regulatory and impose upon the gold-dredging industry of California the necessity of restoring the lands in process of dredging to their original condition of agricultural productivity. Gold-dredging areas are privately owned. Whether useful for agriculture or not they were purchased on the basis of their value for gold-dredging purposes. If their value for agriculture had been greater, they would have still been used for that purpose. The gold dredger has invested his capital in the land and in machinery necessary for the work. He pays from 70 to 80 per cent of the value of the gold he recovers to labor, taxes, machinery, and supplies. Part of the remaining 20 to 30 per cent is applied to the amortization of the original investment in land and dredges.

A surprisingly small acreage of land is involved in gold-dredging operations, probably not to exceed 15,000 acres, and of this, not more than one-half is suitable for agricultural purposes. It is difficult to understand how the Legislature can overlook the substantial benefits accruing to California from gold-dredging and can seriously consider unnecessary regulative laws.

The Fossil Record

BENEATH THE TOMBS of the later Pharaohs of Egypt, beneath the talus of the barren cliffs, the diggers found the forgotten magnificence of the Pharaoh Tutankhamen. In Mesopotamia and Persia excavations of the ruins of ancient cities have revealed the facts that these were builded upon the ruins of still older cities, and in some cases three or four such civilizations, each many centuries older than the one preceding it, and each of which was forgotten before the next was planned, have been dug out, one lying deeper than the other. Each is recognizable by its works of art—its pottery, tools, utensils, architecture, its graven records and literature. Of such records the earlier history of the human civilization has been built up, the chronology of civilizations and their successive characteristics being known by the simple fact that one layer of earth and records overlies the other. This is the evident rule of superposition, by which the upper one is, even to the feeblest intellect, the younger, the deeper one the older, and the deepest one the oldest. The vases, coins, tablets contained in each buried layer are *fossils*, and each layer has accordingly its characteristic fossils, and thus if in different cities the same assemblage of vases, coins, and tablets is found, or even if significant close similarities are found in a certain layer, in Persia and in Egypt, then these layers are known to be of the same or nearly the same age, and thus are correlated, and the period of which they are common records is named, and is the same, of course, for all localities.

A "fossil," etymologically speaking, is something that is dug up. The word comes from the Latin *fodere*, to dig; or *fossa*, a ditch. The more current conception is that it is an animal relic, such as bones; but the meaning is not so restricted. A fossil may be an animal or a plant relic, or a footprint, or a rain-drop print, or a chipped flint, found in the layers of soil or rock. The etymological definition is the accurate one.

How far back do these fossil layers, one below the other, take us? In the Near East they take us back five thousand years or more; but the oldest of these is built on layers of soil or rock or gravel which are older. And here begins in earnest the work of the geologist, and ceases the work of the archæologist, for in these inferior beds there are no more coins or tablets or vases, or any sign of man's art. Such fossils do not exist, but there are the remains of plants, the footprints of birds and mammals, the leaves of trees. And the geologist has found that with deeper layers the character of the life—not human, but animal and plant life—changes and still changes; and thus he has laboriously deciphered a vast and detailed record which carries us back not only thousands but many millions of years; and we know not only the development of civilizations, which the archæologists have taught us, but the development of life. We know not only the evolution of man's art, but the evolution of Nature's handiwork—how she progressed from simple beginnings till she brought forth finally the mammals, and, lastly and quite recently, constructed man. The deciphered records of this history are far more complete and voluminous than those which record the evolution of civilizations.

Thus the study of sedimentation, or how one layer is deposited above the other; and palæontology, which is the study of prehistoric life as revealed by fossils remains, are historical studies quite as accurate and as reliable as those which have to do with the layers of soil, one below the other, whose man-made fossils are investigated by the archæologists; and the rule by which the relative age is determined is still the axiomatic one of superposition. Who doubts one must doubt the other. Who finds the one profane must also find the other so. Who claims to comprehend one and not the other has no real claim to comprehension at all.

In the Far East

THIS IS THE AGE of advertising, and the publicity man is an important figure. Even China is increasingly breaking into print. Customs in the Celestial Kingdom are so frequently the reverse of ours that to the average man the country has been one of inviting mystery, despite the notoriety that revolutionary disturbances have brought it. But its mining industry is becoming more articulate. There is a familiar sound to the news that the China Institution of Mining and Metallurgy recently held its second annual dinner in Peking. At this, it seems, there were the usual speeches, in which it was said that the industry had passed through a trying period in 1922, to some extent due to car shortage; that new railways were essential for development and expansion, all of which seems quite homelike. Agitators, moreover, had caused some unrest among the traditionally patient coolies. Indeed, Chinese thought is modernizing rapidly. An interesting source of information has recently become available in a revised edition of William F. Collins' "Mineral Enterprise in China," published originally in 1918 in Tientsin. The author is a mining engineer and was formerly vice-chairman of the Peking British Chamber of Commerce.

North of China lies Mongolia, another land of mystery, parts of which have just been explored by the Third Asiatic Expedition, sent out by the American Museum of Natural History in New York. Its report will doubtless be forthcoming soon. All in all, the East is rapidly being robbed of its mystery, a natural preliminary to its industrial development.

The 'Gun' Habit

By T. A. Rickard

WHEN a Western American speaks of a 'gun' he means a revolver or pistol. Unfortunately the tawdry part of Western romance is punctuated or punctured, as it were, by shots from a six-shooter. The Derringer and the Colt have been the weapons of the frontier, and the habit survives, from the days of Thompson of Angels—"light and free was the touch of Thompson upon his revolver"—to these later days when unpicturesque ruffians hold up bank cashiers. We do not realize to what an extent our civilization is rendered ridiculous by these antics 'with a gun', but we are reminded that we have peculiar distinction in this regard, for Sir Basil Thomson, former chief of Scotland Yard, the official detective agency of London, has been among us recently and has remarked upon the lightness and freedom of our touch on the trigger, as of that of his near namesake in Bret Harte's familiar poem.

Sir Basil said that the last instance of highway robbery by an armed bandit in England occurred so long ago that he could not remember when it happened. English officers engaged in enforcing the law do not carry fire-arms unless detailed to capture a desperate bandit. Even automobile thieves do not carry them; it means life imprisonment if they are caught with fire-arms in their possession. The subject was deemed worthy of discussion by the American Bar Association. The committee on law enforcement declared that the pistol "serves no useful purpose in the community today" and recommended an embargo on the manufacture and sale of pistols and of the cartridges or ammunition to be used in them, "save as such manufacture may be necessary for governmental and official use under proper regulations and control". Chief Justice Taft, in his speech in San Francisco at the last annual meeting of the Bar Association, quoted the report of the special committee as stating: "We find that more than 90 per cent of the crimes in this country are committed by the use of pistols" and that "the laws prohibiting the carrying of firearms or deadly weapons are ineffective —in fact, that they work to the benefit of the criminal rather than the law-abiding citizen". The report stated that there had been more than 9500 unlawful homicides in this country during the previous year, and that the average for ten years was 8500. This is a lamentable record. It was stated further: "Deliberate murder, burglary, and robbery will seldom be attempted unless the criminal is armed. In European countries the criminals as a rule are not armed". In some States, as in New York, the law prohibits the sale, purchase, or carrying of small arms; but the effect is to cause law-abiding citizens to obey the law and criminals to ignore it. In California the law forbids the carrying of fire-arms without a permit, but as a matter of fact thousands of 'respectable' citizens have pistols in their possession, without a license, as is made evident by the fatalities that ensue among those not of the criminal class. 'Respectable' citizens do not shoot criminals, they shoot each other. Moreover, the number of deaths by accident—not knowing it was loaded—are appallingly numerous. During the New Year revels in New York three persons were killed and fifteen wounded because sundry unknown fools used loaded instead of blank cartridges. At Philadelphia the New Year was saluted by the killing of four persons—two men, a boy, and a girl—who were shot in the same way, because bullets were used instead of blanks. Similar accidents were reported at other cities. The newspapers of San Francisco chronicle the horrors of the day on their front pages; in one issue I learn that a man shot the three children of another man and then killed himself; four men were killed in a gun affray arising from a mere disagreement; a wild bullet, fired by a policeman to stop a drunkard, hit a small boy; a "pretty divorcee" killed an admirer with a pistol that she snatched from him, so she said. This is the record on the front page of one newspaper. Last night I read that a woman had been found dead with her husband's pistol at her side. She happened to be despondent, so she borrowed the respectable citizen's 'gun'. It is pathetic to think of the number of suicides and homicides that happen chiefly because in a moment of aberration a man or woman finds a pistol within easy reach.

Mining engineers go to places where life is endangered by the careless use of the six-shooter and most of us have witnessed homicidal affrays; yet we know that we do not protect ourselves by 'carrying a gun', because that gives an assailant an excuse for shooting, and because such shooting is akin to assassination. The pistol is a coward's weapon; the use of it does not involve a duel, or skill in shooting, so much as getting the drop on the other fellow, which, in plain English, means shooting him before he has a chance to defend himself. The Englishman fights with his fists, the Irishman with a club, the Italian with a dagger, the Negro with a razor—in every case the attack involves personal contact and risk to the attacker, with a chance for the victim to defend himself, whereas the revolver permits an attack at a distance, and so unexpectedly as to preclude defence. Moreover the use of a dagger or a club restricts the fight to the participants; whereas the six-shooter imperils the lives of innocent bystanders. Many are the men that have been killed in mining camps by reckless shootings of which they happened to be accidental witnesses. As viewed from any standpoint the use of the revolver is a blot on our American civilization. No laws or regulations, I fear, will stop the practice; the only way to check it is to restrict the manufacture of revolvers to Government factories and to make it a penal offence for anybody except an officer of the law to carry a revolver. At the time of a strike the penalty for carrying a revolver, shot-gun, or rifle, should be made additionally severe and the arming of men on either side should be prevented by all the power and resources of the municipal and State governments, reinforced by the Federal authority, if necessary. The arming of citizens to protect themselves argues the complete breakdown of government; it may have been excusable in the days when the community was unorganized—on the frontier—but it has no legitimate excuse today. Violence begets violence. We have seen that at Bisbee, Butte, and Herrin. Gun-play is a satire on civilization. Every good citizen should use his influence to educate public opinion into a recognition of the fact that the use of the revolver is a national disgrace.

DISCUSSION

The Klondike Discovery

THE EDITOR:

Sir—The editor of the *Journal-Press*, Mr. J. E. Spurr, is entitled to the warm regard of all Yukoners, wherever now placed, for his presentation in the issues of Dec. 9 and Feb. 17 of the discussion of the discovery of the Klondike. This field, within 4½ miles in three directions from Carmack's discovery, produced $89,000,000, at least, in gold. Wide and careful study of all known placer records shows that to be the richest placer area so far known.

I am moved to reply to some of the inaccuracies in the extremely interesting article by Dr. A. E. Wills and Mr. Wanless. The personal information given is good, but I may say that Carmack did *not* go up 21 Pup (Ganvin Gulch), cross the ridge and drop right down into Gold Bottom at Henderson's discovery. I lived on Ganvin Gulch ten years and more, and at the head of Ganvin you drop right down into Bear Lindon or Last Chance. The nearest distance from the head of Ganvin on the ridge to where you would leave the ridge to go down to Henderson's discovery on Gold Bottom is over six miles along the ridge after leaving the head of Ganvin (21 Pup).

Also, Mr. Wanless says that less than six miles is the distance between Carmack's discovery and Henderson's discovery on Gold Bottom. The actual disance, *air line*, between the two points by accurate survey (McConnell's Map, 1906, scale one-half mile to the inch) is over ten and a quarter miles. Walking distance by the route given would be about fifteen miles.

Mr. W. Ogilvie, a Dominion land surveyor of astronomical attainments (he very closely placed the Alaska Yukon boundary at the Yukon River), a man of high accuracy and high integrity, who was on the spot at the time as surveyor, states that he made careful investigation of Carmack's discovery. Ogilvie was rightfully an enthusiastic Canadian official, truthful, accurate and a kindly man. A warm friend and partisan of Henderson, yet he states (*Scientific American Supplement*, No. 1152, Jan. 29, 1898, p. 18415) that Carmack panned out $12.75 in a few minutes. The route followed by Carmack, the dates, the route of Henderson coming down, are all given entirely different from Dr. A. E. Wills' narrative. Ogilvie made notes on the spot, as was the surveyor's practice; did not trust to memory, and made critical investigation of all sides of the question, right at the very time, in 1896. This supplement can readily be obtained and I would suggest to interested parties that Ogilvie's statement therein and other writings of his are convincing and quite contrary to the statements of Dr. Wills and Mr. Wanless.

Dr. Wills thinks it very absurd that Carmack could have panned out more than the $2 or $3 worth of gold in the gravels. Anyone who knows the rim at the mouth of the Skookums and along Checkaco Hill where the White Channel was cut out over that rim would not be surprised at $700 on the exposed rim on virgin ground being a fair possibility for three men to pan out in two days; $12.75 in a few minutes, according to Mr. Ogilvie's narrative, and the known ground there makes that a possibility.

The two discoveries of Henderson and Carmack were practically simultaneous. Carmack saw Henderson's ground (Ogilvie), and I honor his judgment that he turned it down as to staking. It is doubtful if all Gold Bottom produced as much gold as Carmack's one claim. Personally I know many men who went broke on Gold Bottom even in later days, with every facility in mining, but, believe me, they did not go broke on honest mining around Carmack's discovery if they owned the ground.

If Henderson's was the main discovery, why did Dr. Wills show such good judgment in staking after Carmack's discovery even five miles away and staking after Andy Hunker; but he does not mention staking after Henderson. Paying propositions, only, count, and surely every one knows that Carmack's was the discovery that produced the gold and made the excitement. Personally, I remember Dr. A. E. Wills. I knew Bob Henderson, now at Mayo, and George Carmack, who is now dead. Each did his service for the Yukon. All were good men, but Carmack had many warm friends, including, incidentally, myself. The development of the North dates from Carmack's discovery, regardless of the attempt of Dr. Wills to be authoritative regarding the two discoveries.

GEORGE R. CLARKE.

Corry, Pa.

Rise and Fall of Metallurgical Processes

THE EDITOR:

Sir—The article by E. H. Robie entitled "Rise and Fall of Metallurgical Processes" in the Feb. 10 issue of the *Engineering and Mining Journal-Press* is interesting but discloses little other than the deplorable condition that the honest but ignorant or inexperienced inventor has nowhere to go to get intelligent advice that will aid him or save the waste of money in useless exploitation. The suggestion that a department of the Bureau of Mines or of our large mining and metallurgical societies undertake such work is constructive.

The exposing of what is usually termed "fake" flotation of inventions is important. "Blue-sky" laws have been passed, but there exists no body capable of deciding on technical merits prior to the waste of public money. Having myself been called upon to digest and in one case to report officially upon two of the processes to which the above article refers, I can give some light:

The Sethman electric smelting process, so-called, is in no way a process, as the inventor says he and his associates know nothing of the theory or practice of smelting or pigment manufacture. The test which I witnessed proclaimed this, as they were trying to fuse and slag ore running about 25 per cent zinc sulphide. The work was being done in a crucible furnace on raw sulphide ores, using the usual carbon electrodes and the arc for

heating. The only claim the inventor made was that he had invented a variable voltage, but constant wattage, generator which accommodated itself to the varied resistance of an ore charge. The public and the promoters have done the further act of proclaiming it a smelting process, perhaps with Sethman's consent.

The J. H. Reid processes had as a basis the mixing of a pulverized ore with flux and bituminous coking coal and coking the mass. The coke structure was expected to hold the pulverized ore and fluxes and yield a caked or coked mass, of physical strength suitable for blast furnace or electric fusion and reduction. The theory of mixing ore fluxes and carbon into a hardened mass was good, but held no novelty. The means of preventing the masses from acting like sand or dust thrown into a furnace were entirely lacking. Perhaps 100 patents were applied for, as the patent feature was the stock seller. So far as I could ascertain by examination of the attorney's patent condition, Reid had only a few isolated patent claims allowed. Reid raised over $1,000,000, following one corporation with another, and made several good-sized furnace tests, but there is no record of any economic success, though many complete failures exist, notably when he tried to operate a pig-iron furnace and fed his carbon-sand mixture. The Reid flotation was suspended by the Public Utilities Commission ("blue-sky") of Massachusetts, and all stock is now worthless, and there are legal troubles.

The Coolbaugh process is privately exploited, and the A. S. & R. Co. has joined in its application. Coolbaugh has a patent issued which I believe involves a sulphatizing roast using SO_3 gasses. The zinc sulphate can be renewed by water leaching, but at best a salt of the metal is the issue, with a limited market as such, and thus the value in zinc must be the zinc smelter's ore price. The Coolbaugh process has merit, but it is no Eldorado for the miner, though it may help to reduce excess smelter charges. PARKER C. CHOATE.

Essex, Mass.

Liquid-Oxygen Explosives at Pachuca

THE EDITOR:

Sir—We have been engaged for some time in the preparation of an accurate and authoritative paper on the use of liquid-oxygen explosives at Pachuca. This paper was presented at the February meeting of the American Institute of Mining and Metallurgical Engineers.

Mr. Akin's article which appeared in *Engineering and Mining Journal-Press* of Dec. 2, and which is written in popular vein, leaves the reader with the impression that all that is worth while in the practical application of liquid-oxygen explosives has been developed at Pachuca. This is, of course, not true, for all the important developments in connection with this explosive, including the practical application of it in mining and other work, have taken place in Europe. It is, of course, true that there was uncertainty as to whether the method would prove practicable and economically advantageous under the conditions obtaining at Pachuca, and there were special problems which arose in adapting the new explosive to these conditions which were perhaps unlike anything previously encountered in Europe, but notwithstanding this we hasten on behalf of Compania de Real Del Monte y Pachuca to disclaim credit which rightfully is not its due.

New York. MICHAEL H. KURYLA.
GALEN H. CLEVENGER.

Ore in Sight

THE EDITOR:

Sir—Some time ago Mr. T. A. Rickard gave us a very interesting chapter on "The Right Word." This letter deals with "The Wrong Phrase," as I maintain the phrase "ore in sight" to be, as used by the mining profession everywhere. I would suggest that the words "ore blocked out" should be used instead. The phrase "ore in sight" is misleading, inaccurate, and unjust, whereas "ore blocked out," which is of equal length, is the reverse, and will convey the correct meaning to the uninitiated as well as the initiated, which is important, for it is often the layman who furnishes the money for the exploitation of mining ventures.

Let us take, for example, a prospective mine, on which the owner has exposed a vein of commercial size and value for a length of say 2,000 ft. by surface cuts and strippings placed closely together, and has also driven four or five tunnels, all in ore, but has not put up any upraises as yet. Though there is plenty of payable ore in the open cuts and strippings, and also in the tunnels, as well as on the dumps, there are no blocks of ore exposed on three sides. Is it not misleading, inaccurate, unjust and even nonsensical to speak of such a property as "having no ore in sight"? If one said that such a property had "lots of ore in sight but none blocked out" one would be stating conditions exactly as they are, without any inaccuracy or unfairness to the property. DONALD C. SIMPSON.

Smithers, B. C.

White Collars vs. Dirty Jobs

THE EDITOR:

Sir—In your issue of Jan. 13, 1923, regarding "White Collars vs. Dirty Jobs," I can say that Mr. Hubert has made an unreasonable account for the young educated mining man. And for hating the dirty end of learning the mining game he proudly says, "Good for them."

I think it is a pity that, after a man has gone through college and obtained an education, he will mar his future because he is afraid of getting his hands and clothes dirty with a little clean rock. The fact that a college man has an education does not prove him mentally better than the average in a mine. If the young graduate is going into the game from the bottom up, he had better forget all about being better than the other fellow and get in and dig, make the best of all conditions, and use only his education to gain the things he is there for.

According to Mr. Hubert, two or three days at shoveling and dumping ore is enough experience for the young man, as he knew how to dump ore and shovel ever since he was "knee-high to a grasshopper." I hope the young man after his college education is not going into the mines to learn shoveling alone, because after he learns that he still has a lot to learn before he has a good practical idea of mining. The young engineers are, as a rule, placed on a muck stick, because it is an actual tryout of a man, and furthermore they are, as a rule, not experienced enough to take a machineman's or a timberman's job. The young man is not in the mine to become an expert machine man or a timberman—he is there to get the best idea he can of actual underground operations.

If I was to give the young educated man a tip, I would say: Buckle up against the collar, boys, with all your might, and don't be afraid of a little dirt. If you are, you will be a failure long before you get halfway up

the ladder. Make the best of all the conditions you have to contend with that you think are not most pleasant, as they are not half as bad as you think they are. The interest and intelligence you use in your work will be your guide as to which road you will take in this wonderful game of mining.

Carson Hill, Calif. FRANK S. FERRARIS.

Amalgamation, All-Cyanidation, and Thievery

THE EDITOR:

Sir—In the article entitled "Amalgamation, All-Cyanidation, and Thievery" appearing in the *Journal-Press* of Jan. 13, A. W. Allen seems to deplore that amalgamation has been side-stepped, and he takes a fling at the "up-to-date" Canadian practice of all-cyanidation. He bases all his objections to the adoption of this practice on the supposition that the method was adopted solely to get away from thievery of amalgam, and by citing a certain case in northern Ontario he shows how the solution head samples had been diluted in order to prevent detection of those implicated in the theft. From this he argues how inadequate the present method of sampling is in plants using all-cyanidation.

The plants in Grass Valley have been in operation for a great many years; they are well established and well managed; they crush in water and amalgamate in battery and upon plates. I would like to know from Mr. Allen how they arrive at their head values to the battery except by amalgam plus cyanide heads. I agree with Mr. Allen that there should be a check on the solution values—in fact, more than one if possible. Often, the conditions at a mine are such as to get fair estimates of different stopes and to allow keeping tab on the tons delivered to the mill from each of these. Another sample of raw ore may be taken after coarse crushing, but this is never satisfactory unless large sampling equipment is installed, which may be done in extensive installations. In all-cyanidation plants, the solution sample, if properly taken and an accurate account kept of tonnage, is not valueless, but is of supreme importance as indicative of what the clean-up returns will be. Solution samples may be tampered with of course; so may any other sample; and solution check samples are so much more readily taken. In assaying them fewer factors of error creep in than in reducing a large sample of spotty ore, even after grinding to 100 mesh.

It is, of course, admitted that when crushing in water to a fine state of comminution before concentrating and amalgamating, good opportunities are afforded for an excellent head sample, but even here are chances for discrepancy. The amount of gold accumulating in the closed circuit will vary with the character of the ore, and though a head sample of this kind should give a good check on the solution values, it would not necessarily check the raw ore or mine sample.

As a precaution, most such samples can be taken by automatic devices and can be kept under lock and key, as can also the solution drip samples; but, after all, well selected, honest men are the best protection, and these, I believe, can readily be picked in large, well-established companies. Personally, I believe Hamlet was in error, or at least unduly pessimistic, when he said to be an honest man was to be one out of a thousand. I do not believe there is much of a chance to carry on large-scale pilfering such as Mr. Allen refers to, in a large well-organized plant. It is in the small plant where inadequate sampling facilities obtain, and where one man has to cover all branches of the operation, that the greatest opportunity for dishonesty exists, and the opportunities are certainly vastly greater where amalgamation is practiced than where all-cyanidation prevails. For if precipitation presses are used, these are cleaned only once or twice a month, and some responsible person can be present until this product is weighed and sampled.

I was in Porcupine when the all-cyanide practice was introduced there. I made several trips to the Hollinger with the sole object of observing the concentrating tables, for I had seen the "streaks of yellow gold" on the tables at the Goldfield mill when that plant was crushing in water and I was anxious to see if this same condition obtained when crushing in solution in close circuit.

The Hollinger was then running on what is ordinarily termed high-grade ore, but there was no yellow streak or free gold to be discovered on the concentrator tables. I was most favorably impressed with the method, and my confidence in it has increased with the passing years—at least, so far as it pertains to most of the gold mines in northern Ontario. As already stated, Mr. Allen's attack upon the method appears to be based wholly on the supposition that the only thing in its favor is to get away from amalgam thievery. To attain this object, no doubt, has been one of the potent factors, but I believe that the practice can stand on its own merit.

Toronto, Ont. HENRY HANSON.

Concerning a Crank

THE EDITOR:

Sir—How about this? In the Feb. 10 *Dearborn Independent* is an article, "What's So and What Isn't About Evolution," by George McCready Price, professor of geology, Pacific Union College, California, from which the following is taken:

"It used to be taught that geology gave us a very precise outline of the order in which the various types of life have appeared on the earth. It has long been taught that certain low types of life lived in a certain age, say the Cambrian, and that afterward, when these had all died off, certain other higher forms of life appeared, to be in turn succeeded by others still higher in the scale. This would, indeed, be an outline or skeleton of a development series; and it would not be unreasonable to think somehow or other these forms might have been connected by descent.

"But more recently, many facts have been discovered which put these matters in an altogether new light. In many places all over the world, strata containing fossils have been found in a relative order which formerly was thought to be utterly impossible. That is, the fossils have been found in the wrong order, and on such a scale that there can be no mistake about it. For when an area 500 miles long and from 20 to 50 miles wide is found with the Paleozoic rocks on top, or composing the mountains, and with Cretaceous beds underneath, or composing the valleys, and running under these mountains all around, as in the case of the Glacier National Park and the southern part of Alberta, the old notion about the exact and invariable order of the fossils has to be given up entirely. It now seems that the value of this whole geological series is about that of the German mark or the Russian ruble. It may be a good classification series, or a serial arrangement of the ancient forms of life, but we can no longer maintain that its 'formations' have any intrinsic time value whatever."

It occurs to me that possibly the "Cretaceous beds in the valleys running underneath the Paleozoic rocks" may be just an appearance. Such an appearance could easily be produced in a valley of deformation. I have seen a number of such valleys around this section.

Prescott, Ariz. WILLIAM CROCKER.

The Use of Sodium Peroxide in Cyanidation at the Teck-Hughes Gold Mine

Deleterious Effect of Tellurides Largely Obviated by Introduction of This Oxidizing Agent in First Agitator — Net Extra Savings of 40@80c. per Ton Made—Mechanical Details Solved

By David L. H. Forbes
Manager, Teck-Hughes Gold Mines, Ltd.

D. L. H. Forbes

THE ORE from the lower levels of the Teck-Hughes mine at Kirkland Lake, Ontario, has a portion of its gold in combination with tellurium and requires exceedingly fine grinding and intense oxidation during the cyanide treatment to bring the extraction above 90 per cent.

The use of sodium peroxide was first tried in the mill in January, 1922, as a result of a series of laboratory experiments with several different oxidizing reagents. The peculiar properties of sodium peroxide made the results of laboratory tests somewhat uncertain, but the indications of parallel tests with and without its use were uniformly favorable, so it was decided to devise a process by which it could be applied continuously during cyanide treatment in the mill.

The first mill test was of three days' duration and on ore that assayed about 1 oz. of gold to the ton. From the results of this test, the increase in extraction was indicated to be a little over 3 per cent, which was considered good in view of the fact that the device used for feeding the sodium peroxide gave considerable trouble and only an irregular and intermittent feed. The average rate of feed, however, was about one-half a pound peroxide to the ton of ore treated. The feeding device consisted of a small compressed air motor attached to an inclosed auger and arranged so that the air, after driving the motor, had to mix with the powdered peroxide dropping from the auger and carry it through a 1-in. pipe under the surface of the pulp in the first agitator. This device would work well for about an hour, but the air motor and pipe would then become clogged with a sticky mass of caustic soda that had to be removed before the feeder would function properly again.

The next test lasted ten days at about the same rate of feed, but using the type of feeder that is described in the patent specifications[1] for the process. This is a simple device on the principle of creating a swirling movement of the entire charge of sodium peroxide powder with a stream of compressed air entering the container tangentially near its base in such a way that the air, to escape from the container, must entrain about the desired amount of sodium peroxide and deliver it to the pulp in the agitators well below the surface line. During the progress of this test the lower tailing loss was quite marked, and, at the conclusion of the test, when the precipitate was melted down to bullion, the operators were pleasantly surprised at the absence of the customary offensive tellurium fumes and so-called matte (an undesirable compound of gold and tellurium with some silver, selenium, and sulphur). The mill log for the entire month's operation showed that the process had been in use thirteen days, that the peroxide consumption was 800 lb. against a total tonnage of 3,767, and that the extraction for the month was 6.5 per cent higher than that of the preceding month, while the grinding and other milling conditions remained about the same. During February and March, 1922, the process was used during longer test periods, with similar favorable results, and finally became established as a definite part of the Teck-Hughes cyanide practice.

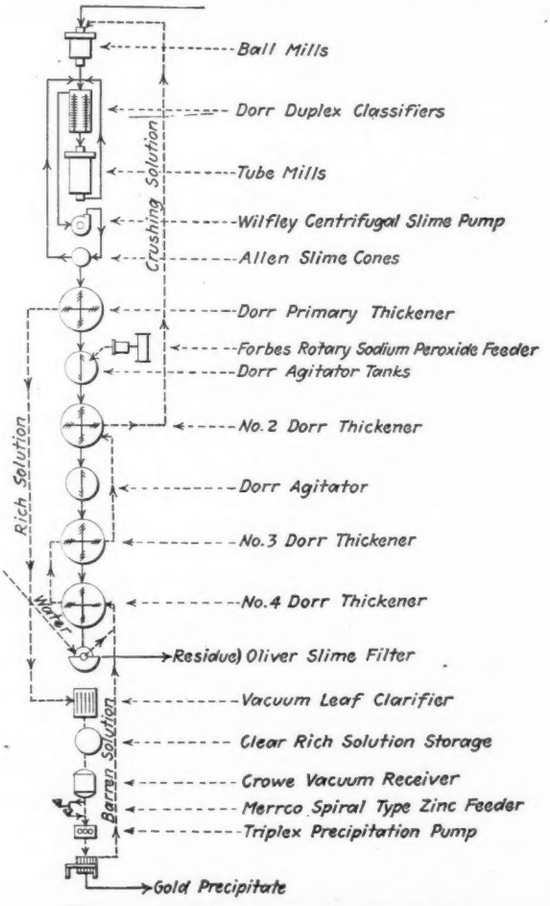
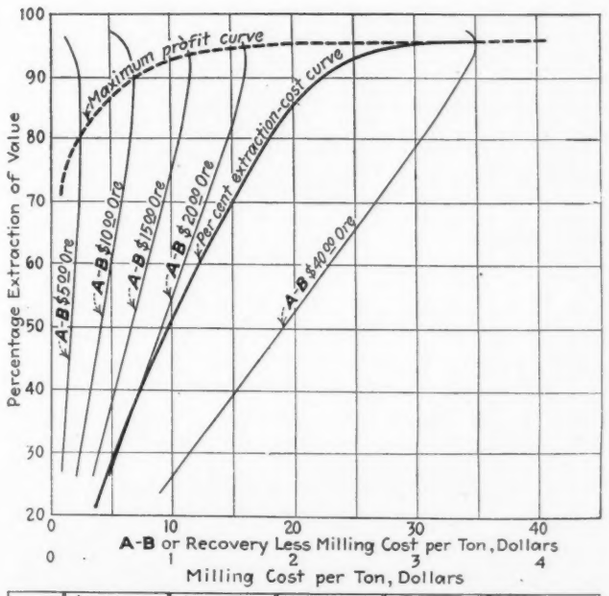


Fig. 1—Outline of cyanide treatment

[1] U. S. Patent No. 1,430,635; Canadian Patent No. 226,961.


Maximum profit curve
Per cent extraction-cost curve
A-B $5.00 Ore
A-B $10.00 Ore
A-B $15.00 Ore
A-B $20.00 Ore
A-B $40.00 Ore
Percentage Extraction of Value
A-B or Recovery Less Milling Cost per Ton, Dollars
Milling Cost per Ton, Dollars

PER CENT EXTRACTION	$5.00 Ore			$10.00 Ore			$15.00 Ore			$20.00 Ore			$40.00 Ore		
	$A	$B	$A-B	$A	$B	$A-B	$A	$B	$A-B	$A	$B	$A-B	$A	$B	$A-B
60	3.00	1.00	2.00	6.00	1.00	5.00	9.00	1.00	8.00	12.00	1.00	11.00	24.00	1.00	23.00
70	3.50	1.25	2.25	7.00	1.25	5.75	10.50	1.25	9.25	14.00	1.25	12.75	28.00	1.25	26.75
80	4.00	1.65	2.35	8.00	1.65	6.35	12.00	1.65	10.35	16.00	1.65	14.35	32.00	1.65	30.25
90	4.50	2.25	2.25	9.00	2.25	6.75	13.50	2.25	11.25	18.00	2.25	15.75	36.00	2.25	33.75
95	4.75	3.00	1.75	9.50	3.00	6.50	14.25	3.00	11.25	19.00	3.00	16.00	38.00	3.00	35.00

A = Value recovered per ton
B = Milling cost per ton for different percentages of extraction

Fig. 2—Relation of grade of ore to maximum profit for varying percentages of extraction

The present type of apparatus for feeding the sodium peroxide gives no trouble whatever, and ensures the complete use of the peroxide in the stage of the cyanide treatment process where it will give the best results. This new device is a revolving type of feeder, and a regulated current of dry compressed air, passing through the revolving chamber, entrains the desired quantity of peroxide and carries it to the pulp in the agitators.

The quantity of sodium peroxide used per ton of ore varies with the grade of the ore. On ore of 2-oz. grade or better, it appears to be desirable to use as much as 1 lb. or more of peroxide to the ton, but the upper limit is reached when the settlers and slime filters begin to give trouble from colloidal silica, the formation of which is due to the presence of excessive amounts of caustic soda in the mill solutions. Ordinarily, on an ore of $20 to $30 grade, from 0.4 to 0.6 lb. per ton gives the best over-all results in the mill, and, for this peroxide consumption, the extra milling cost is only 12 to 18c. per ton, whereas the increased recovery amounts to from 50c. to $1 per ton.

The application of the sodium peroxide process is simple and inexpensive. Fig. 1 gives a diagrammatic outline of the cyanide treatment, with its use in the present mill of the Teck-Hughes company.

Fig. 2 shows graphically the economic results obtained with small-scale operation on this class of ore, giving the relations of grade of ore, percentage extractions, milling costs, and the estimated curve for the highest economic percentage extraction for the different grades of ore for treatment tonnages up to 160 per day.

Whether or not the sodium peroxide process can be successfully applied to other ores than those of the Kirkland Lake district is still unknown. For telluride ores in general, however, it seems probable that it can be applied to advantage. Also, in the treatment of certain classes of concentrates by fine grinding in cyanide solution it is probable that the process might be used both to hasten and improve the extraction of the precious metals and to prevent premature precipitation during the treatment.

On many classes of gold ore, however, it will undoubtedly be true that, unless refractory compounds of the precious metals are present, the sodium peroxide process will not accomplish any useful purpose that cannot be attained otherwise at equal or less cost by finer grinding and longer treatment, with abundance of air for agitation. Its chief use at present seems to be indicated for ores or concentrates that yield only a low recovery by the ordinary cyaniding methods.

Sulphide Corporation, in Australia, Reports on Current Operations

The following particulars regarding the recent operation of the Sulphide Corporation's properties in Australia are taken from the annual report for the year ended June 30, 1922:

The operations at the mine were carried on without interruption with lower costs and with a maintenance of the average grade. The ore reserves have been somewhat reduced, but still stand at the large tonnage of 1,343,180 tons. Last year the figure was 1,461,783 tons. The mine prospects have been improved by the publication of a geological report on Broken Hill, which is favorable to the continuation of the orebody in depth, and boreholes, put down below the 1,400-ft. level, confirm the favorable geological forecast.

On account of the falling off of outside supplies of ore, it was decided to shut down the smelting and refining plant at Cockle Creek and hand over the smelting products to the works of the Associated Smelters at Port Pirie, where, owing to the large scale of the operations, smelting is carried on more economically than at the company's works. The acid and super-phosphate plant at Cockle Creek is still kept running, and does a considerable business.

Arrangements have been made with the Electrolytic Zinc Company of Australia for the roasting of that company's zinc concentrates at Cockle Creek, enabling the Sulphide Corporation to obtain the sulphur required for its acid works, thus avoiding the necessity of importing sulphur from abroad. At the zinc works in England at Seaton Carew, which last year were shut down for several months on account of the coal strike, business is now being carried on with prospects of satisfactory return.

Particulars of the mill and smelter results for the last four years are given in the tables below:

	Year to June 30			
	1922	1921	1920	1919
	Tons	Tons		Tons
Crude ore treated	120,810	62,236	Mill	120,285
Dump slimes treated	27,131	12,527	closed	9,655
Lead concentrates produced	26,657	13,571	owing to	25,446
Zinc concentrates produced	45,924	21,538	strike	36,650
	£ s. d.	£ s. d.		£ s. d.
Cost per ton lead concentrates	11 15 10	12 9 5	.....	9 5 2
Cost per ton zinc concentrates	1 2 6	1 3 6	.....	1 0 6

Smelter Statistics

Lead concentrates and purchased ores smelted, tons	49,889	49,074	15,885	85,356
Bullion produced, tons	18,972	15,349	3,849	25,790
Gold in bullion, ounces	8,253	7,631	5,802	14,388
Silver in bullion, ounces	1,670,296	1,546,284	503,493	2,229,683

The Marketing of Marble

Material Is Used in Exterior and Interior Building Construction —The Trade Has Problems Peculiar to Itself—Transportation and Grading Important Factors—Statistics Unsatisfactory

By John Stephen Sewell
President, Alabama Marble Co.

CHEMICALLY AND MINERALOGICALLY speaking, marble is a crystalline limestone, either practically pure calcium carbonate, or containing varying percentages of magnesium carbonate, up to that which constitutes it a pure dolomite. This definition includes the so-called onyx marbles. Commercially, other stones of agreeable color and texture, which will take a finish suitable for interior decorative work, are classed as marbles. The principal of these—the only one of great importance—is the so-called Verde-Antique marble, which is mainly serpentine, a hydrous magnesium silicate.

Marble Used in Construction of Buildings

Marble is used for exterior and interior work in buildings, for monumental purposes, including mausoleums and gravestones; for soda fountains and similar fixtures, and, to some extent, for bric-a-brac. It was formerly much used for wash-basin slabs, but those engaged in the marble trade have allowed the enameled iron ware to drive them almost out of this market, by superior selling methods. No systematic advertising compaign, having in view the enlargement of the marble market and the diversification of its uses, has ever been undertaken. The existing market has been created by the material itself. Marble is used where, in addition to necessary utilitarian qualities, a certain beauty of color and texture is demanded.

Statuary marble is the sculptor's one suitable natural material; the commercial monumental marbles, in their various grades, furnish the material for the mausoleums and mortuary monuments of the rich and the modest headstones for the graves of the poor. For exterior use in rich dwellings and monumental buildings, and for the interior finish of all sorts of high-class buildings, it is the most highly prized of all available materials; for interior finish, in many cases, marble has come to be regarded as a necessity. No satisfactory substitute has been found, though men have been seeking for one since the days of the Romans. But this is due to the material itself: the selling efforts of the trade have been concentrated on the question of whose marble should be used, when marble of some kind was sure to be used, anyway. This is especially true with respect to interior marbles, where limestones and granites do not furnish the competition which they do in the exterior and monumental trades. There is a virgin field for the development of a demand for marble for pastry and candy slabs in the home as well as elsewhere, for the working shelves of kitchen cabinets, for lighting fixtures and lamp bases, for bric-a-brac of many kinds and uses, as well as for extending its application as an interior finish in residences and in other buildings where its use has not hitherto occurred to owners and architects generally. When free from metallic impurities, it is an excellent material for switchboards, panel-boards, and for electrical purposes; but where beauty is not of importance, it has a strong competitor in the purer kinds of slate.

The exterior and monumental marbles used in the United States are practically all of domestic origin. None of the foreign marbles, with the possible exception of selected Pentellikon, will stand exposure in this climate. Of the interior marbles used, probably 40 per cent are imported—mainly from Italy. The remainder are of domestic origin.

Marble is, or has been, produced in this country in the following states: Vermont, Massachusetts, New York, Pennsylvania, Minnesota, Maryland, Tennessee, Georgia, Alabama, Missouri, Texas, Colorado, Arizona, California, and Alaska. At the present time, the principal sources are Vermont, Tennessee, Georgia, Alabama, Missouri, and Alaska.

Marble of some kind is pretty sure to be found in any region where, over considerable areas, the earlier Paleozoic strata have been metamorphosed, but it is frequently found among later rocks. The famous deposits near Carrara, in Italy, are said to be of Triassic age. There is no lack of extensive deposits; but, from the standpoint of profitable operation, the material is uncertain, and the number of idle and useless quarries greatly exceeds that of the active ones. The present producing capacity is in excess of the average consumption, and equal to any peak demand that is likely to occur.

The greater portion of the imported marble comes in at New York. For use in the Far West, considerable quantities are brought in at San Francisco. Some shipments come in at New Orleans. For the deposits now being developed in Guatemala, New Orleans will be the logical port of entry.

Commercial Organization of the Trade

The marble trade is divided as follows: (1) So-called wholesalers, who sell marble, as a rule, only to the trade, and in the form of blocks or sawed stock. (2) Manufacturers, who own no quarries, buy their marble in the rough (blocks or sawed stock), and finish it. In the interior marble trade, the greater part of the marble finished by the manufacturers is also set in place by them. (3) Marble dealers or contractors, who have neither quarries nor plants, but buy finished marble and sell it to the customer, set in place. (4) Producers, who have quarries but no plants, and sell their blocks to the wholesalers or the manufacturers. (5) Manufacturing producers, who have both quarries and plants, and who engage in any and all activities of the trade as a whole.

The principal headquarters of all the wholesalers are in New York; for their business, New York is the principal marketing point of the entire country. But every producing center is also a marketing point for blocks and sawed stock, and the aggregate sales of unfinished materials at such points exceed those of all

the wholesalers, when all the uses of marble are considered. Some producers, whether they have plants or not, sell blocks through the wholesalers; some sell direct to the manufacturers, and others follow both plans.

Manufacturing Centers Well Distributed

There are large manufacturing plants in every active producing region. Stone yards and monumental shops are found all over the country, where exterior and monumental work may be finished. Some of these establishments can take blocks and saw them, whereas others buy the stock sawed to size and finish it. For the trade in interior marbles, besides the producing centers, the principal manufacturers are in Boston, New York, Philadelphia, Baltimore, Buffalo, Detroit, Milwaukee, Minneapolis and St. Paul, Peoria, Chicago, Cincinnati, St. Louis, Louisville, New Orleans, Los Angeles, and San Francisco. Smaller plants are situated in other places, such as Pittsburgh and Cleveland, but the places named handle in the aggregate probably 90 per cent of the interior marble not finished at or near the quarries. Although the manufacture of interior marble is generally confined to certain localities, the market for practically every marble used in the United States is the whole country. Every plant of any size in any of the three branches of the trade has probably done work which was installed in sections of the country most remote from the plant itself. A small amount of interior marble, manufactured in this country, has been exported to Cuba and to South America. Of course, every manufacturing center is a consuming center for the raw material.

Exterior and monumental marble in finished form is used all over the country. Public buildings, in places not otherwise important, may be built of marble; marble mausoleums and marble gravestones are to be found everywhere. Wealthy men sometimes build residences of marble in rather remote places. Finished interior marble is used to a much greater extent in the large towns and great cities, but even in small towns and villages it is beginning to be used in banks, hotels, courthouses, schools, and hospitals.

Measurement of Marble

Marble in the block and in sawed slabs more than two inches thick is invariably measured and sold by the cubic foot. Slabs two inches and less in thickness are usually measured and sold by the square foot. Contracts for finished marble in place are usually let on a lump sum basis.

The merchandising of unfinished marble within the trade has no set rules or established general customs. The wholesaler sometimes sells the rough blocks directly to the owner of the buildings in which the marble is to be used; there is always some one who will saw and finish the marble for him, but it is usually cheaper for the owner to buy the marble set in place, and leave upon the trade the responsibility for selecting material to meet the requirements. The manufacturing producer, figuring on a job set in place, often finds himself facing a competition from manufacturers and dealers who are figuring in his own material. Whichever wins, the loser is likely to be "sore." The manufacturer often finds himself facing competition from a dealer who has no plant or other fixed and permanent investment, but who has made arrangements—or counts on making arrangements—to buy the finished marble from some manufacturing producer. This always arouses the indignation of the manufacturer, even though he himself may be selling finished marble f.o.b. to some other dealer, to compete with some other manufacturer.

Some of the wholesalers and dealers in blocks and sawed stock have no consistent price policy in reference to their own materials, so that a manufacturer, figuring a job specified in such material, cannot always be sure whether he has the real price on the rough material or not.

There has been reason to suspect that a wholesaler, through secret control of one or more finishing plants, has occasionally competed with his own manufacturing customers in their own business. The manufacturing producer does the same thing, only he does it openly, as a part of his avowed policy. These are only a few of the anomalous situations that may and do arise. So far as marketing is concerned, the conditions are chaotic.

No set rule will suffice to guide the newcomer; he must be wary, and treat each case separately on its own merits, until he is well acquainted not only with conditions but with personnel also. His acquaintance does not have to be extensive to embrace the responsible heads of all the marble concerns in the country.

With the exception of New York City and vicinity, the entire country is an open market for finished marble; that is, marble finished in one place may be shipped anywhere else and there set in place, whether the local marble men like it or not. Until recently, finished marble was excluded from New York City and vicinity by virtue of an agreement to that effect between the local employers and the local unions. So far as the employers are concerned, the government has compelled them to withdraw from this agreement. But the unions are maintaining the situation on their own account and irrespective of the employers; so that New York is still a "closed town" in the marble trade. Any one may ship blocks and sawed stock into New York—but if an outsider ships in finished marble, the setters will refuse to handle it. A situation of this sort is difficult to handle through governmental agencies. Conditions were similar in San Francisco until recently, when the citizens decided to correct them, even at considerable cost to themselves. They have succeeded—and probably nothing short of similar action in New York will ever make of the city an "open town." Possibly the New York people prefer conditions as they are—they have been so for fully twenty years and are not entirely disadvantageous to the city as a whole. It goes without saying that there is considerable hostility between the marble trade in New York and that in the rest of the country; the New Yorker can sell finished marble outside, but the outsider cannot sell in New York.

Statistics Not Comprehensive Enough

Statistics as to marble production are collected by the U. S. Geological Survey. None whatever are collected as to actual consumption. Statistics of production are unreliable, because many blocks are sold at their full size at a reduced price per cubic foot for the reason that they contain defects which will reduce the number of cubic feet of actual merchantable marble far below the invoice measurements.

In other words, a considerable part of the production reported as marble is scrap and nothing else. From such sources as were available, and from my own experience in the trade, I made an attempt to estimate the

size of the marble market for the years 1910 to 1915 inclusive. The results are set forth in the accompanying table. It is probable that they are inaccurate by as much as 30 per cent; even at that, they are believed to be the most trustworthy figures ever compiled. In this table, the number of cubic feet used, is, as nearly as possible, the minimum number of cubic feet of normal merchantable blocks—i.e., blocks subject only to normal wastes in sawing and finishing, out of which the finished work could have been secured.

The "value" is an estimate of the cost of the material finished and set in place, to the ultimate purchaser. The figures as to cubic feet used are probably more accurate than the values, year by year. But if all the years be totaled, all the figures are equally reliable—or unreliable—as one may look at it.

Imported Marbles—Used Mostly for Interior Work

Year	No. of Cu.Ft. Used	Value to Ultimate Purchaser
1910	789,000	$9,468,000.00
1911	625,000	7,500,000.00
1912	637,000	7,644,000.00
1913	643,000	7,716,000.00
1914	567,000	6,804,000.00
1915	334,000	4,008,000.00
Domestic Marbles—Interior Work		
1910	1,105,000	$8,840,000.00
1911	1,192,000	9,536,000.00
1912	1,237,000	9,896,000.00
1913	1,105,000	8,840,000.00
1914	1,372,000	10,976,000.00
1915	1,167,000	9,336,000.00
Domestic Marbles—Monumental Work		
1912	1,546,000	$9,276,000.00
1913	1,670,000	10,020,000.00
1914	1,508,000	9,048,000.00
1915	1,321,000	7,386,000.00
Domestic Marbles—Exterior Work		
1912	3,154,000	$9,462,000.00
1913	1,389,000	4,167,000.00
1914	1,330,000	3,990,000.00
1915	1,330,000	3,990,000.00

It is my opinion that for the years 1910-1914 inclusive the total amount paid by ultimate consumers for marble in all of its forms—excluding byproducts—varied from not less than $25,000,000 per year to not over $40,000,000 per year. At the present time, costs and prices both are about 60 to 70 per cent higher than before the war. Consumption is probably not so great. It is doubtful whether the amount paid for marble during 1922 would total more than $40,000,000 if the facts could be brought out.

During 1915 and 1916 many marble concerns went into bankruptcy. The capacity thus lost is probably just about restored at this time; with a gradual but decided increase in demand, prices are still falling, and will soon be below the danger line for weak concerns, unless there is a change.

There are no marked seasonal variations in the demand for marble. Much of it is sold on large contracts; these are closed long before delivery is wanted, and usually partial payments are made on finished material awaiting delivery.

Marble is classified as to kinds or varieties, and each kind or variety often exhibits enough variation to require separation into two or more grades. The natural color of perfectly pure crystalline calcium carbonate in the form of marble is white, with generally a slight bluish tinge. But little white marble is perfectly pure; when a white groundmass is the distinguishing characteristic, even though it is freely marked with veins or clouding, the material is called a white marble, and is graded according to the amount, character, and distribution of the veins or clouding. The veins and clouding are usually grayish, blackish or greenish. If they are more brilliant in color they may cause the marble to be classified with the variegated or "fancy" marbles, although the majority of the latter owe their rich colorings to brecciation of the original material and subsequent consolidation with infiltration of various coloring materials from surrounding soil and rocks.

The various gray, buff-gray, and pink or pinkish marbles, giving the effect of a uniform ground tone of soft and neutral quality (Tavernelle Botticino, Tennessee, Carthage and others) are graded according to the general tone produced in large masses—or occasionally, because of veins and clouding differing decidedly in color from the groundmass.

Each fancy marble is classified by itself. Several kinds may come from the same locality or the same quarry, and these may have a name in common, like a family name, but each has its own individual name besides. Some may be richer and more desirable, or rarer, or more difficult to get, than others, but they are not usually treated as "grades" of the same material.

Marbles to be desirable for interior use should be fine grained and take a high polish; but many coarse-grained marbles are excellent for building and monumental purposes. From the nature of the case, no uniform system of classification and grading can be applied to marbles generally, any more than to all the different kinds of woods used in the arts.

White marbles must be sound—i.e., free from cracks and visible strain lines. In other marbles, this is not cause for rejecting, provided the cracks can be filled and waxed so as to be invisible under ordinary examination.

Chemical composition is not of importance except where scrap marble is used for chemical purposes, in which case a pure calcium carbonate is always specified. Certain ingredients unfit some marbles for exterior work, but no case of this is known where chemical analysis is needed to detect them. The foreign materials nearly always present add to the beauty of the material in some cases, and then again may ruin it. The final criterion in this respect is not the nature or amount of the impurity, but the question of whether the material is pleasing to the eye or not.

Marbles that are both rare and beautiful bring a high price, but have a limited market. Those that are agreeable in tone, texture, and finish and readily obtainable in large quantities bring a fair price and have a wide market. A limited amount of marble that is not at all attractive may be sold, at some price; but, in the long run, this is a doubtful advantage.

Marble blocks, to be "merchantable," must usually be at least five or six feet long, three feet or more in width, and two feet or more in thickness. A usual standard size of block is 7x5x4 ft. The measurements should be, as nearly as possible, what they would be if all irregularities of surface and shape were eliminated.

Marble weighs about 175 lb. per cu.ft. But an honestly measured block should weigh from 185 to 200 lb. per cu.ft. of invoice measurement.

Marble blocks are usually shipped in gondola cars. Each block should be supported by two strips of timber thick enough to permit a sling to be passed under it, for lifting. It should also be braced to prevent shifting by rough switching and vibration. Marble blocks

weigh from ten to forty tons each, the average being, probably, about fifteen tons. I once saw three carloads of my own blocks which had been in a collision, or which had in some other way been subjected to rough treatment. They were in steel gondolas. All of the blocks had shifted forward; the forward block in each car had punched through the end of the car, and was overhanging almost enough to fall between the cars. The blocks were not injured; but if one of them had fallen while the train was running, everything behind it would have been piled up.

Sawed slabs are shipped in gondolas or box cars. They are supported on floor cleats on edge in a slightly inclined position, closely nested together, usually in the four corners of the car. They are braced and harnessed in place with 2x4-in. or heavier stuff, so that they cannot move, and so each group of slabs is like a built-up block. Breakage is practically negligible.

Finished slabs are treated in the same manner, but are always shipped in box cars; otherwise cinders would get between the polished faces and scratch them. Polished faces are put together, with paper between.

Heavy finished stock is often packed in the car, using the car body as a packing case, cleats and excelsior being used to prevent shifting and rubbing.

In L.C.L.[1] shipments, marble, either sawed or finished, must be crated so as to protect it and enable it to be handled with ease and safety. Railroad classifications are usually specific as to how marble shall be prepared and loaded for shipment. The minimum carload for marble of all kinds, east of the Mississippi, is 40,000 lb.

Damage in transit is surprisingly small, considering the nature of the material, especially when in thin slabs and polished. There is no general custom about insurance of shipments; it is believed to be the exception.

Unfinished marble may be freely stored in the open, but in the North in the winter, blocks may get covered with ice and slabs may freeze together, so that covered storage is getting to be the rule. Finished marble should always be stored under cover.

The usual terms of a sale within the trade call for payment in thirty days from date of shipment. Special terms are often made, and the stronger dealers usually discount their bills. Inquiry among the well-managed companies indicated that accounts receivable usually stand at the equivalent of about six weeks' sales. Considering the amounts of retained percentages on contracts that are nearly always included in accounts receivable, this would indicate that the business is actually as well as theoretically on about a thirty-day basis.

The credit risks are serious, owing to the great number of builders doing business on inadequate capital and often on an unsound basis. These risks affect everybody, whether he takes contracts for marble set in place or not; for if he does not, his customers do. Any newcomer in the marble business should lose no time in acquainting himself with credit conditions in the building trades, unless he already knows them. By the time a newcomer has been through the experience of putting a new marble on the market once, he will have learned all the producer needs to know. On two principal points, if he is new to the business, much stress should be laid: (1) He should find out all about his own marble, where it really belongs in the trade, how many grades he will have and the percentage of each, and how to convey to the architect a correct idea of what sort of job he can expect if he specifies it. This is a serious and expensive task; it is the principal cause of many failures. (2) He must create the market for his own material or else pay, and pay well, to have it done. It is useless to expect the trade to do it for him; if those comprising it do so, they will also eat him alive. It might be added that he is pretty sure to need at least four times as much capital as he thinks he will need at first.

Except for finished marble in New York City, the market is open and there is no control of prices or territories; but the age-old conflict between the producer and the middleman is fierce and unrestrained, and as against the new producer, the middleman always has the position of advantage. That is the reason so many producers are also manufacturers.

Before the war, the average price of good grades of commercial interior marble was about $2.50 per cu.ft. at point of sale—i.e., f.o.b. New York or quarry. But the variation of price, according to kind and grade, was from $1.50 to $12. Similar figures for monumental stock are, average, $2; extremes, $1 to $6. For exterior building work, average, $1.50; extremes, $0.75 to $3. All of these figures are probably about 60 per cent higher now, except for the more expensive kinds, which are about the same. Fully 75 per cent of all the marble sold brings nearly the average price.

The cost of sawing and finishing marble, including necessary waste, is generally considerably greater than the block price, and the cost of freight and setting is fully equal to it. By the time a reasonable profit is added, the cost to the final purchaser is from three and one-half to four and one-half times the block price. In the cheaper marbles the ratio is greater; in more expensive marbles, it is less. It is less in exterior building work, as a rule, than in interior and monumental work. Prices fluctuate with activities in the different lines, but not as much as those of other commodities. Reliable statistics, however, are not available.

The prices of the more widely used imported marbles practically fix the prices for the corresponding kinds and grades of domestic marbles. The tariff makes some difference, but when it is lowered, the importer or the foreign producer generally keeps most of the difference.

The ordinary white Italian marbles are somewhat easier to handle than the domestic white marbles that compete with them. The distribution of the clouding and veining is more uniform in the Italian marbles, and the slabs from any one block are practically alike and all of one grade. But in warmth and purity of background, in polishing qualities, in hardness and resistance to staining, the better domestic marbles are distinctly superior to the Italian. When properly handled, they are more desirable in high-class commercial work, and they cost a little less.

In marbles other than the white, the imported marbles are usually more expensive and troublesome to work than the domestic; but they hold their own because of qualities of color or texture for which no complete equivalent has yet been found in this country. In percentage of total amount used, the domestic marbles seem to be slowly gaining, with more intensive development of the deposits and increased skill in the selection and use of the material. But it is improbable that the imported marbles, even of standard grades, will ever be driven out of the country, or that the average annual consumption over any great length of time diminished. The domestic marbles will find increased demand in the increasing use of marble.

[1]Less than carload.

Present Status of Mining in Alaska

Development Retarded by Lack of Transportation Facilities and by Restrictions of Present Government Policy—Costs High—British Columbia's Aid for Prospectors Contrasted—Need for Diverse Industry

BY HARRY J. PHILLIPS

Harry J. Phillips

AT A TIME when there is much comment on the affairs of Alaska, a "sourdough" prospector's view of conditions affecting mining may be acceptable. The common conception of Alaska as an ice-bound barren waste should be corrected. The longitude and climate compares favorably with that of the Scandinavian countries, and the southwestern coast is influenced by the warm Japan Current. It is not unusual to see it raining at Christmas time in some of the towns on this coast. The winter in the interior is more severe, but I have been able to see little difference between winter conditions there and those at Lead, S. D., or in the San Juan Mountains in Colorado, where mining is carried on the year around. There is, moreover, compensation for the Alaskan winter in the greater amount of daylight in the summer months.

Because of the extra daylight, the rate of growth of vegetation is almost doubled in Alaska. Vegetation is abundant in most parts of the territory. Alaska has abundant spruce and hemlock, and timber for mining is easily obtained in most parts of the territory. For the most part Alaska is a rain-belt country. Wheat and other crops have been grown successfully and await only a market and a population to be produced on a large scale.

With its area of 586,000 square miles, the territory has all the topographical variations of plains and mountains found in the Pacific Coast states. A large part is occupied by the northerly extension of the coast range which extends through the two Americas to the Horn and is mineralized throughout its length. The Aleutian branch of the Alaskan Mountains forms with the main range a great horseshoe.

There is evidence of extensive mineralization in these mountains. The great Alaskan Range, with its numerous spurs, is probably destined to produce a large proportion of the world's minerals. Owing to the lack of transportation, this virgin territory is almost wholly unprospected, and the possibilities of the numerous lode and placer prospects in other parts of the territory are little known.

Extensive glacial action in some places has scattered the gold derived from the weathering of veins so that the source of the placers is not evident, although there are exceptions, such as the Crow Creek placers on Turnagain Arm of Cook's Inlet, where the gold is clearly traceable to its source in the lodes at the head of the creek, and has the same content of silver as the lode gold.

Numerous deposits of coal are found in the territory, and there is evidence of the occurrence of oil in considerable quantity in the country. In some spots it has already been found.

I have never seen so many streams suitable for power as in Alaska. It is notable that almost every mineral deposit discovered has a suitable site near by. This condition compares favorably with the lack of cheap power for mining in the "favored" Southwest. In the absence of water power, coal is easily accessible for power for mining and metallurgical operations in most parts of the territory.

During thirty-seven years of mining, Alaska has produced $450,000,000 in gold, silver, copper, and other minerals, but the country has not been developed nor even prospected. Thus far the search has been mostly for deposits of placer gold of the bonanza type along the coast or on large rivers where water transportation is possible. The present decline in the mineral production is due to the effect of the war upon mining in general.

As in other mining districts, gold mining in Alaska started with the discovery and operation of the bonanza type of placer deposit, which could be worked by crude methods with little outlay of capital. This production was maintained at a fairly steady rate because of the successive discovery of such camps as Nome, Fairbanks, Iditarod, Hot Springs, Ruby, and others. Another steadying influence in the production of recent years has been the introduction of dredges to handle the large deposits of low-grade gravel in the same camps where the bonanza deposits were being exhausted by ordinary mining methods.

MANY DISCOURAGING FACTS CONFRONT PROSPECTOR

The prospector is discouraged at present by the cessation of mining operations upon which he depends largely for his support, by the exhaustion of the rich pay-dirt which requires no capital for mining and by the effects of the World War. Since 1910 the white population has decreased from 50,000 to 20,000 at present. Although promising discoveries were made in the interior, lack of transportation was an insurmountable difficulty to exploration. The greatest hope of the placer miner is, first, in the improvement of transportation facilities throughout the territory; second, in the installation of modern electric dredges to work the low-grade deposits; and finally, in a return to pre-war conditions.

The capital which is essential to mining is discouraged by high costs and high taxes as well as by government interference. It should not be inferred from the foregoing that the gold has all been discovered or exhausted to any great extent, even in the oldest and most

accessible camps, for it is a well-known fact that vigorous prospecting and keen interest in mining, such as exist during a boom, are necessary to the discovery of new deposits. Some means of support to hold the old-fashioned prospector in the country would probably result in further discoveries, together with the steady development of a mining district. Since mining has declined so far, it will require a long time to return to former conditions.

Transportation Necessary for Lode Mining

As in other mining sections, lode mining is a secondary development. The most important requirement for the development of lode mining in Alaska is transportation. A large part of the territory's future production will come from the extensive lode deposits at present unrecognized. A few favored lode mines situated on tide water have made a notable production. But how many lodes were found on the tide waters of California, of Australia, India, or South Africa? In any country the prospector must gain access to the interior—to the higher ranges—to find the lode deposits. Is it any wonder, then, that the development of mining in Alaska is slow, when an almost total lack of transportation, except that by dog sleds, exists?

Why should British Columbia surpass the United States at present in the successful development of new prospects? There is one important reason: government aid. When a prospector makes a promising mineral discovery, the Canadian Government immediately investigates, and in most cases that government will at least cut a horse trail to the new district. In the early development of the Willow Creek lode camp, in Alaska, which is beginning to show a fair production of gold, the early prospectors had to cut a road through 25 miles of timber to get the first stamp mill into the district. The government has since spent considerable money upon the roads of this camp, but if the discoverers had not made almost superhuman efforts to build the first trails to the camp, the district would probably be today undeveloped. It is still necessary, when a prospector makes a new discovery in Willow Creek, to travel 45 miles and then pay a government official $1.50 to have a claim recorded.

In other sections of the territory, I have examined promising lode prospects which await only transportation to become producers. I also have data collected in such examinations which prove that these prospects could be successfully operated if the cost of transportation were sufficiently lowered. As a prospect must be brought to the stage where capital may be interested by the performing of a certain amount of development work, and as the prospector is without funds for building trails or roads, the development of lode mining as well as that of placer mining is in many districts impossible.

Government's Policy Destructive

Ranking almost with transportation in importance is the need of a constructive government policy. In Alaska the policy of the Forestry Department is supposedly constructive, but it is in reality destructive. We of the Northwest believe that a populated productive land is better than a wilderness. We approve the Pinchot policy of conservation of natural resources, with the exception that we think that its purpose should be to protect with more energy the timber which is being wasted in the populated communities and not to interfere with the heart-breaking, soul-trying work of the honest pioneer in Alaska, whose heroic labor should have at least the same support as that of the early pioneers in the western United States. To save the rights of these pioneers, to build new industries and new homes, is also wise. The effect of the restrictions of red tape, bureaucratic administration at a distance of 4,000 miles, ill-framed mineral laws, is well known, but there is one unfortunate condition which can be remedied through the Forestry Department. Alaska's vast timber wealth is of no use to the United States at present, because of restrictive laws. A miner's existence depends upon the development of other industries near by. Population is essential to mining.

As an example of the effect of the present government policy upon the development of mining, the case of the operation of a small lode-mining property with which I was connected may be of pertinent interest. Trails had been built with an amount of capital that was already too limited. A small quartz mill was freighted to one prospect after much effort, and finally stoping began. A few hundred feet of small timber was required for this work and for construction about the camp, but it was necessary to write the Land Office in the opposite end of the Territory, first for permission to cut the timber, and then, when the permit had been received after a considerable delay, it was necessary to pay one-quarter cent per foot for the timber. Mining costs were very high because of the excessive cost of transportation. It was an heroic struggle and a useless one. As soon as the mine began to produce, numerous requests for statements of production and requests for payment of the various forms of taxes were received, which actually required the services of a clerk. In addition a poll tax was exacted from each member of the mine crew. The costs were more than the small mill could meet, even when treating a good grade of ore. The production of about $75,000 was barely sufficient to meet the high costs, and lack of funds to drive a new level forced a shutdown. A body of commercial ore is exposed at this property, which would be regarded as a bonanza in the older camps of the United States, but this ore and that in many other similar prospects will remain in the ground until the present obstructions to development are removed.

Government Railway Should Have Tributary Roads

Several promising prospects which I have visited require only a horse trail, or a bridge, to make them accessible, but in the case of a surface outcrop, an investment in road building by private individuals is not warranted until a conservative amount of ore is blocked out, which is impossible without means of access to the property. This is the psychological moment when a government agent should examine the prospect. If it possesses merit, a trail may be built, and, since almost invariably numerous other veins exist in the vicinity of the first discovery, the expenditure of a few hundred dollars by the government may increase the taxable resources of the country by many millions.

The building of the new government railroad to the interior of Alaska is duly appreciated by the pioneers of Alaska, but it is useless without roads to connect the adjacent territory. Twelve miles from this railroad is a large outcrop of silver-lead ore which may be a second Bunker Hill & Sullivan. Assays of $25 have been obtained across a 35-ft. width of this outcrop.

Another large lode deposit near by pans gold across a width of 60 ft., and there are other promising prospects in the same vicinity. In going from the railroad to these prospects, however, one must risk his life in swimming a horse across the intervening Chulitna River and its branches.

Fifty miles from the railroad, and opposite the station of Lignite, is the Kantishna district, from which a quantity of silver ore was shipped which had to be worth over $600 per ton to pay expenses. Gold lode and placer prospects in the same districts appear to have merit. A wagon road connecting this district with the railroad is now under consideration by the Alaska Road Commission. It is encouraging to note that the railroad will be of real service to the new Mayo district, where discoveries are promising enough to warrant the belief that a permanent mining camp is in the making.

A large variety of minerals and allied resources are found in Alaska, including coal and iron. Promising deposits of antimony, molybdenum, tungsten, and cinnabar are known to exist. Since, as noted above, the latitude and the resources compare favorably with those of Sweden, the principal need is population, which requires the existence of industry. All of the industries depend upon each other. Their development must be simultaneous. But the basic industry of a new country, and the one upon which all others depend, is mining. Develop the mines and free the other natural resources, and Alaska will develop.

An example of what a mineral discovery may mean, if assisted to the productive stage, may be seen in Kennecott, which has been shipping three-quarters of a million pounds of copper every month and could produce more if market conditions warranted. The Treadwell mine, with its production of $23,000,000 at a cost of $8,000,000, is another example.

The numerous deposits of coal in Alaska are capable of accelerating the development of the territory under a constructive governmental policy. Designed to prevent exploitation by capital, the present coal-land leasing act harms the pioneer in Alaska most of all. Although the large operator is effectively prevented from using the coal, the small operator or local population is even more effectively prevented from using the resources which rightfully belong to the pioneer of small means in his struggle to overcome the hardships found in this frontier country. The same may be said of the oil-leasing act. A prospector must have a small fortune in order to develop an oil claim under the present government requirements. The importance of the oil deposits in Alaska must be proved by drilling. Oil seepages and geological evidence appear to favor the existence of oil in some localities. A factor which will affect the production of oil is the unusual disturbance of the formation which is observed in some places.

It may be concluded that the important factors in the progress of mining in Alaska are transportation, governmental and economic conditions, and population. The territory needs government aid. It needs encouragement of industry. In his splendid editorial on Alaska which recently appeared in the *Engineering and Mining Journal-Press*, Mr. Rickard quoted a statement by Mr. Lee Key, writing in the *Northwest Mining Truth* of Feb. 15, which will bear repeating. The need of Alaska, he says, is "a return to the simple freedom of individual opportunity which peopled and prospered the United States."

Village Deep Mine, True to Name, at 6,263 Ft.

The main shaft of the Village Deep mine, the deepest mine on the Rand, in South Africa, has now been sunk to a vertical depth of 6,263 ft., or 629 ft. below sea level, according to the *South African Mining and Engineering Journal*. The average depth of stoping is 5,000 ft. Work is now commencing on the sinking of two subsidiary inclines from the 32d level at a vertical depth of 6,068 ft., which will be carried down to an even greater depth than the main incline has reached.

The great difficulty in mining at such an enormous depth is to deal effectively with the immense rock pressure, according to the report. Huge quantities of timber are required to secure the workings, this adding materially to the cost. At the Village Deep, the cost for "support of workings" is 1s. 7d. per ton mined. In November, about 59,000 tons of ore was mined, averaging about $6.80 per ton. Working costs were 21s. 8d. per ton (about $5.16) and the company made a profit of £20,000 ($90,000).

The Village Deep is not the deepest mine in the world, however, or even the deepest gold mine, that honor going to the Morro Velho mine of the St. John del Rey Mining Co., Ltd., which has been worked continuously since 1834 and is now said to be developed on the 22d level, 6,426 ft. deep, vertically. There the air temperature is 109 deg. and that of the rock, 116 deg.

Two or three other shafts on the Rand are more than a mile deep, and two vertical shafts of the Ooregum Gold Mining Co. of India, Ltd., in the Kolar gold field, are reported to be 5,700 and 6,000 ft. deep. The deepest shaft in the United States is the vertical No. 5 Tamarack shaft of the Calumet & Hecla company in Michigan, which has now reached a depth of 5,308 ft.

The Song of the Santa Cruz

BY E. G. HICKEY

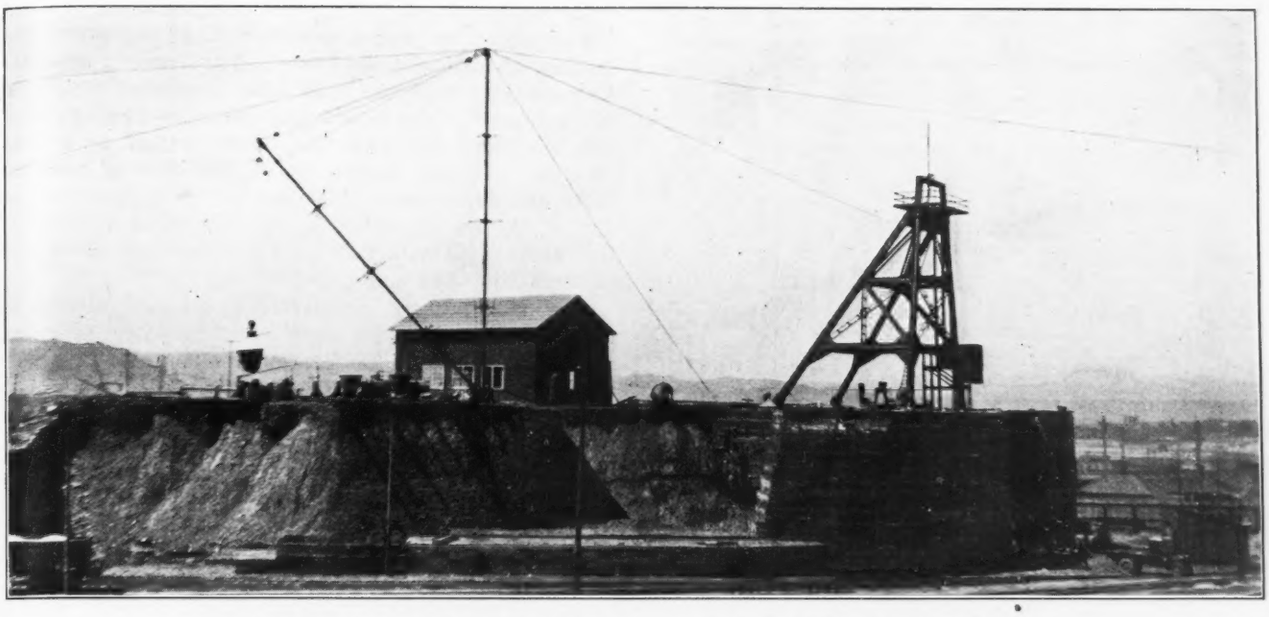
This is the song of the Santa Cruz
  And the Escondido crew;
We caught its jar from the peaks afar,
  And the deep abysmal blue;
But your ears are not attuned to the spheres,
  So we'll hand it down to you.

God gave us brains, but He makes us serve
  The greed of the lesser man;
With vicious thrust we pierce Earth's crust,
  Its innermost depths to scan,
And search for a split in the heart of it,
  That was made when the world began.

We make our home where the tigers roam
  And the coyotes howl in the night;
We work in the dark by the light of a spark,
  And rend the hills with our might,
To tear from the earth that has given it birth,
  The metal that's man's delight.

We make our bed 'neath a Mexican shed
  And sleep in the cold and rain;
We spend our lives without children or wives,
  Fresh wealth for the world to gain,
In this land of rot—that God forgot—
  Then remembered and cursed again.

This is the song of the Santa Cruz
  And the Escondido crew,
And this Easter tide o'er the spaces wide,
  We send it along to you.



Surface plant at No. 4 shaft before completion. Note slag foundation.

Notes on East Butte's Mining Operations

In Which the Method Adopted for Raising a Shaft Through Loose Sand Is Described, Together with the Preliminary Work Necessary and Features of the Recent Additions to Surface Plant

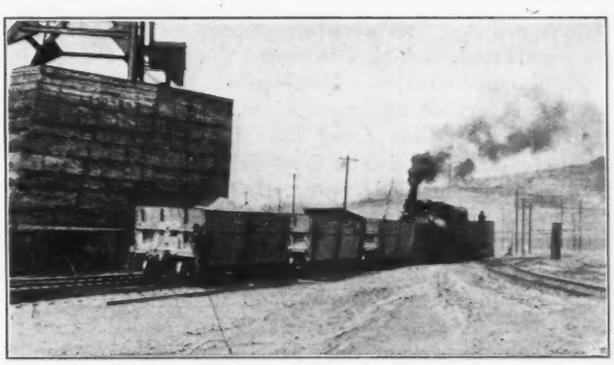
By Felix Edgar Wormser

Assistant Editor

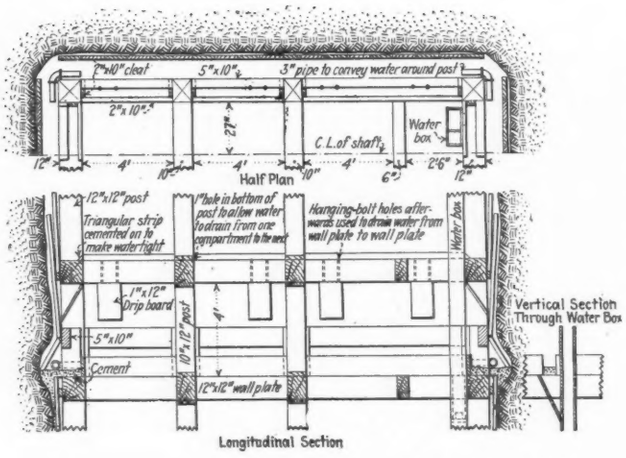
COPPER MINING COMPANIES seldom mine, concentrate, and smelt their own ore, and even when they do, the various units of the plant are generally widely separated, sometimes by several miles. An exceptionally compact establishment is that of the East Butte Copper Mining Co., in which mine entrance, concentrator, and smelter are situated within a stone's throw of one another. Although output and capacity are relatively small—2,000,000 lb. of copper monthly—the holdings of the company occupy a large tract of land in the eastern part of the Butte district.

The reduction works are capable of highly efficient work. Materials are handled automatically where possible; standard-gage railroad cars of special design for quick and clean dumping, drawn by Shay-geared locomotives, transfer supplies and products from place to place. The corporation works what is locally known as the Pittsmont mine, and the surface plant, unlike the plants of most mines in Butte, which are on a hillside, has been built on a comparatively flat area—the valley of upper Silver Bow Creek. Heavy beds of loose gravel, clay, and sand, in places 600 ft. thick, have been washed into this locality from the adjacent mountains. Early efforts to develop this section near favorable mine-workings of neighboring properties were hampered by difficulty in sinking a shaft through the beds of loose material, which were impregnated with water and had a composition almost like quicksand. This circumstance led to the transfer of operations farther east, nearer to the foot hills of the imposing Main Range of mountains, or Continental Divide, that rises sharply on the east side of Butte. A shaft was successfully sunk there, but it necessarily was located several thousand feet distant from the nearest known occurrence of ore. Nevertheless, the character of the rock formations was found to be identical with that of the then producing part of the camp. Veinlets of ore were found which opened into orebodies of commercial value, and their development brought operations to present magnitude.

Early exploration was conducted at a depth of 1,200 ft. from the surface of the valley, corresponding to a depth of about 1,800 ft. from the surface of the older properties "on the hill." At this depth many veins showed a tendency toward a development of iron sulphides. In working to the higher levels, the effect of secondary enrichment became more and more marked



A train of East Butte ore.



Arrangement used to catch water in the shaft.

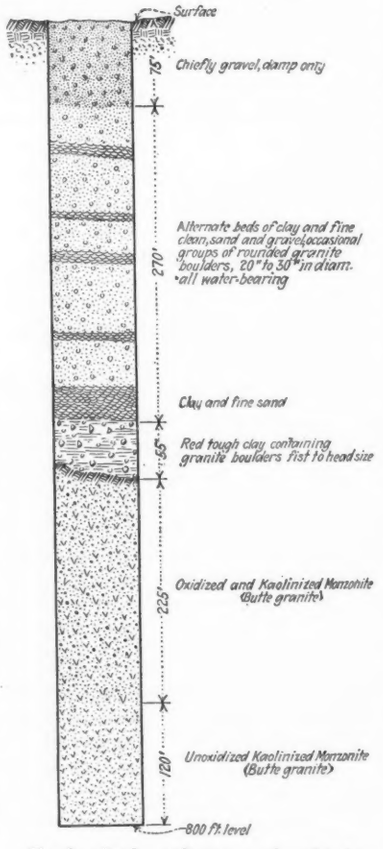
and resulted in finding ore of greater mineral content and extensive mineralization in the wall rocks. Consequently, development was confined for a number of years to ground above the 1,200 level. As the development of higher levels progressed, attention has been given to lower depths. A level was opened at a depth of 1,500 ft. and subsequently at 1,800 ft. It was found that though an increased iron content was evident in some veins, others carried a heavy original mineralization of high-grade sulphides, principally enargite and chalcocite, that showed little change with depth. One such vein discovered on the 1,200 level was found to be cut off completely a few sets above. It has, however, been followed downward for 600 ft. and is still strong at the bottom of the 1,800 level—the lowest developed. The success attending the work on the 1,500 and 1,800 levels caused deeper mining to be considered. A new shaft nearer the main orebodies and penetrating the gravel beds was planned and has been driven recently to a depth of 2,400 ft. Its construction embodies several features that are distinctly out of the ordinary.

Churn Drilling for a Dual Purpose

The new shaft has been so located as to obviate the long crosscutting necessary on each level of the old shaft to reach the main ore-bearing area. Hence it is in that part of the company's property which experience had shown to contain thick beds of sandy water-bearing ground. It was finally decided to raise the shaft from the 1,800 level to the surface. As the character of the ground through which the shaft was to pass was known only slightly, churn-drill holes were bored around the proposed location of the shaft to obtain not only an accurate record of the strata to be penetrated, but also to drain the area—a most important consideration. Twelve-inch holes were drilled from the surface at three points, about 100 ft. distant in three directions from the shaft location, with a semi-portable No. 2 Standard drill rig. Ordinary oil-well drilling methods were used. The gravelly and clayey nature of the ground drilled is shown in an accompanying geological sketch. After these holes had been drilled to the 800 level, 6-in. perforated casings were set in place to correspond in position with the water-bearing strata. The casing was sealed by means of packers to prevent the water running down the outside of the casing. The flow of water from the drill holes was connected with the drainage system of the mine and controlled. The outer casings used in sinking the holes were then withdrawn and the perforated casings allowed to drain freely. The quantity of water first issuing from the drill holes amounted to 150 to 250 gal. per minute, a flow that diminished rapidly during the first few days and then settled to a rate showing a steady decline and a final flow of from 20 to 40 gal. per minute. This was held to indicate drainage of the excess water in the immediate vicinity of the shaft and reduction to a normal rate of influx through the sand and gravel.

The clogging of perforations through silting—a serious problem in such work—was overcome by using comparatively large perforations in sufficient number to provide excess capacity and by allowing the initial flow of water to continue uninterruptedly for some time. It is thought that this action washes out the finer particles of sand and mud around each perforation and converts the coarser material into a porous structure, preventing clogging by fine matter. Stopping the flow of water for even a short interval was found to choke the perforations. Without the valuable assistance given by churn-drill-hole drainage the raising of the shaft through the sand and gravel beds would have been impracticable.

The new shaft is known as No. 4. It is rectangular, and has three compartments, possessing no features, so far as timbering is concerned, distinguishing it from many other Butte shafts. Excavation is 7x19 ft. in the clear; the shaft is divided into two main and one auxiliary hoisting compartments, each 4x4½ ft. in the clear. Adjoining the auxiliary hoisting compartment is a pipe compartment 2½ ft. wide separated from it by a 6x12-in. removable center. Timbering is Oregon fir. The general arrangement of the shaft is shown in an accompanying diagram. Lagging is 2-in. native fir.

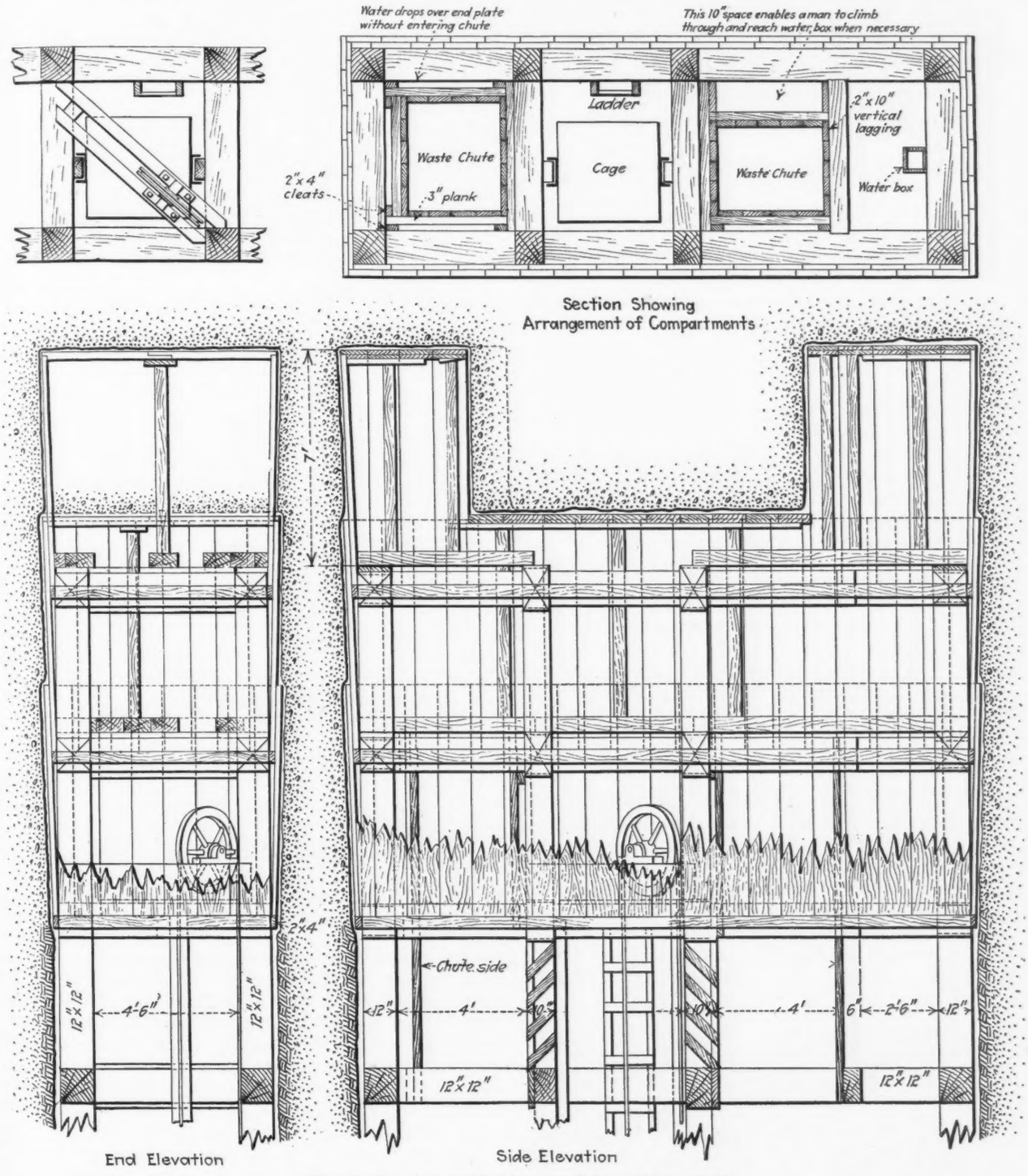

Surface
75'
Chiefly gravel, damp only
Alternate beds of clay and fine clean sand and gravel, occasional groups of rounded granite boulders, 20" to 30" in diam. all water-bearing
270'
Clay and fine sand
55'
Red tough clay containing granite boulders fist to head size
Oxidized and Kaolinized Monzonite (Butte granite)
225'
Unoxidized Kaolinized Monzonite (Butte granite)
120'
800 ft. level

Geological column of strata through which shaft No. 4 was raised

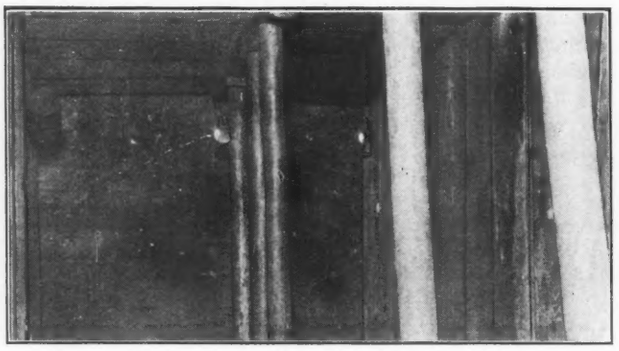
Raising the shaft through the granite presented no unusual difficulties. Work was begun on the 1,800 level, the lowest in the mine. The two outside compartments were used for the disposal of waste and the middle compartment as a cageway. To minimize the trouble from the hanging-up of material in the chutes, especially when wet, they were built smaller than the size of the compartments, to exclude water. Vertical chute lining was spiked to 3-in. horizontal cleats opposite the wall

plates, and the cleats were separated from wall and end plates by 2-in. spacing blocks, which permitted the water to fall from one plate to another without entering the chute. Another expedient consisted in constructing the sides of the chutes next to the cageway in shutter fashion—that is, 3x18-in. planks were placed at an angle to the shaft somewhat in the form of a shutter (see diagram). The planking was composed of one 3x8-in. and one 3x10-in. piece. This construction enabled a quick inspection of the chute to be made from the cage, and, when necessary, arched waste could be started running again. It also avoided destruction of the chute by compression of air in a heavy fall of ground when it hangs up and then breaks away suddenly.

A light steel cage was used to raise men and materials and was set eccentrically in the cage compartment to make room for a ladder and to permit passage of men and material from the highest position of the cage to working floors above. The 15-in. clearance obtained provided room enough to move timber and supplies from the cage to the working floor above. A collapsible gin-pole with block and tackle helped greatly in this work. Its construction is shown in a diagram.



Sketch showing timbering used in raising shaft.



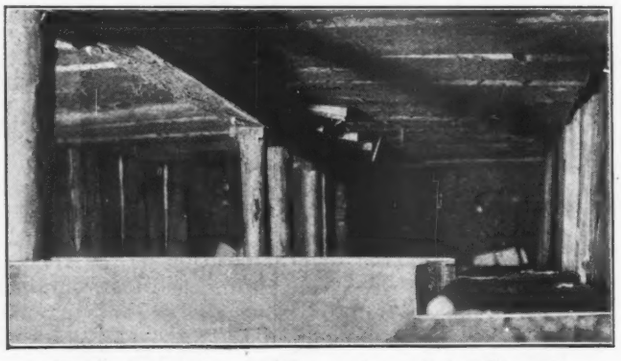
Interior of shaft, showing appearance of working face and timbering.

An 8x10-in. compressed-air hoist on the 1,800 level operated the cage and was moved to the 800 level after the shaft was raised to that height. A rope from the hoist drum was passed under a sheave, up the near corner of the cage compartment, and over a 30-in. sheave mounted on a portable crosshead which was supported diagonally across the center compartment on the wall plates. This crosshead and sheave was moved upward every fourth set as the raising progressed, and was never more than 30 ft. from the back. A sketch gives a diagrammatic view of this arrangement.

Water was removed in a square wooden-box column, 8 in. on a side, carried up the pipe compartment. The water was occasionally collected on the wall plates by concrete dams and directed into the water box. Details of this arrangement are shown in a figure. Waste was removed from the chutes at the highest level practicable. To break the fall of the waste, bumpers were placed in the chutes where permissible, or bypasses were constructed in the solid rock below the gravel beds; that is, connections were made between the two waste chutes in the longitudinal walls of the shaft, so that the material from one passed into a bypass and diagonally across and down two sets to the other chute, there to continue its journey down the shaft.

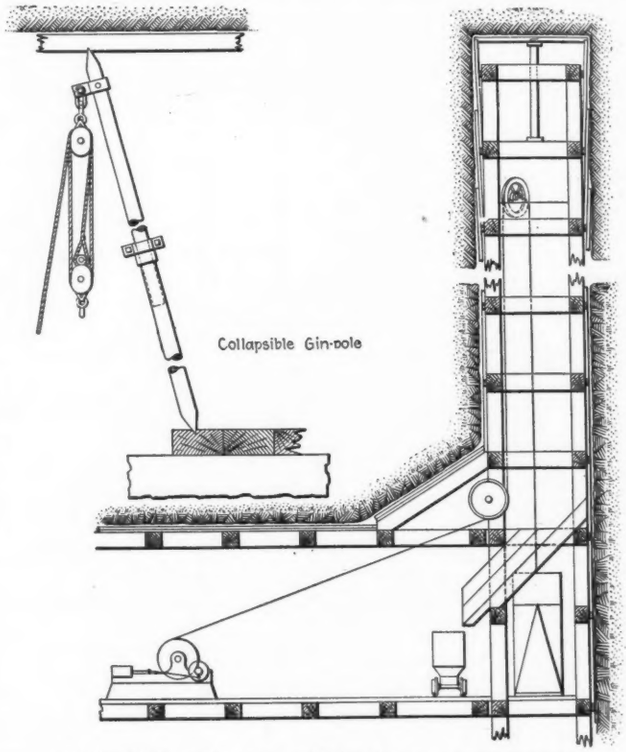
System of Raising Changed in Soft Ground

After the shaft had been raised through the granite a special method of working had to be devised to pass through the gravel, clay, and sand known to lie above. A scheme was evolved by Andrew Ray, mine superintendent, and plans were so carefully made that the work was completed without a hitch. It called for the making of a series of parallel slices across the short dimension of the shaft, followed closely by special timbering to support the sides and ends of the excavation. Two-inch lagging about 7 ft. 4 in. long, resting upon cleats spiked to wall and end plates, was capped with headboards framed to the end of the lagging. Reference to a diagram illustrating this method of framing will give a much better impression of the construction than a page of description. The headboards were spliced in the center with a lap joint and supported by a small round post, about 4 in. in diameter, securely wedged in place. Two photos taken with difficulty while the work was in progress have been kindly supplied by A. F. Robertson, and these give a good idea of the actual appearance of the timbering.



Shaft timbering, with a view of headboards.

Working procedure was simple. A headboard was removed from one end of the shaft and a slice of ground the width of the headboard and just high enough to admit a new pair of side lagging and headboard was excavated. The loose character of the gravel made the use of powder unnecessary, the material being easily broken down with a pick. This step was repeated until the excavation was completed. Slices were often started from both ends and worked toward the center. At no time was a part of the back exposed greater than the area of one headboard. Provided the ground did not carry sufficient water to make it run, this method of working was eminently satisfactory. Suitable 8x10-in. staging furnished a floor upon which the miners could work. As the setting of a continuous row of small round posts through the center of the working floor caused inconvenience in handling material, short horizontal pieces, each supporting a number of headboards, in turn supported by a single post, avoided this trouble. Offsetting the round posts on the proper side of the splice in the headboard made it possible to put them in place before the individual supports were removed, and in turn permitted placing the next set of individual supports. The collapsible gin-pole mentioned above added materially to the efficiency of the work. It



Collapsible gin-pole and hoisting arrangement.

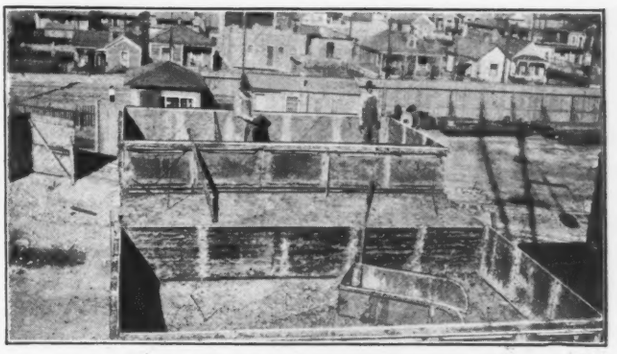
allowed quick and convenient adjustment at any point of the rope blocks required for hoisting the heavy timbers into place, holding the top block against the back of the excavation so as to give a maximum range in lifting.

The method used made it possible to raise continuously through 400 ft. of loose sand and gravel with excellent progress and economy. Minimum advance during any one month was 95 ft.; maximum, 221 ft. Raising through the hard granite from the 1,800 to the 800 level was done with a footage ranging from 135 to 150 ft. per month. In that phase of the work two eight-hour shifts were employed; in the gravel beds from bedrock to surface three shifts were worked continuously to avoid loosening and settling of the soil. Accurate alignment was essential to success, and it is worth noting that the shaft holed through within 2½ in. of its projected location. Mr. Robertson, engineer of the company, was responsible for this part of the work.

Surface Plant Details

While underground developments were going on, preparation was made, and construction and erection begun, of the new hoist, headframe, and ore bins on the surface. The headframe is a sturdy steel structure 59 ft. high. Its base is built on a slag foundation 33 ft. above the collar of the shaft. The center line of the sheave axle is 83 ft. above the collar of the shaft. The sheave bearing-boxes, contrary to usual practice in the Butte district, are built horizontally, permitting easier adjustment than with the vertical type. This is a particularly important consideration where a flat wire rope is used, as at East Butte, and has been found by experience to be an important factor in reducing the cost of flat-rope maintenance. Although a flat rope is not generally used in newer hoisting installations, on account of the expense of resewing, it was adopted for the new East Butte plant because it admits of a more satisfactory compensation for deep hoisting. The hoist has a 20x60-in. steam cylinder, was built by Fraser & Chalmers and remodeled by Nordberg. It is 750 hp. in capacity and capable of hoisting from a depth of 2,600 ft. A steam hoist was chosen for the reason that the property contains a highly efficient steam plant, which, besides supplying heating requirements, drives several steam units in other parts of the property. The added cost of producing steam for the new hoist was therefore purely a matter of the actual cost for fuel and water. Furthermore, efficient operation at deep levels requires a high rate of hoisting speed, which calls for a heavy power input during starting and acceleration when electrical equipment is used. A motor-generator flywheel set could be used to obviate this difficulty, but involves a highly expensive installation. In view of these considerations, it was deemed advisable to use a steam hoist. Four-ton skips will be used to hoist ore and waste, and they will travel at a speed of approximately 2,000 ft. per minute.

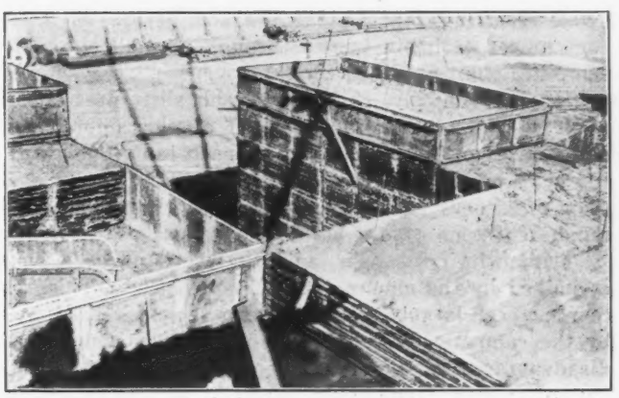
The Pittsmont plant uses a large amount of blast-furnace slag in the construction of various units. The use of slag for such purposes is not new. The Parrot smelter, operating in the late 90's, cast building blocks similar in size and shape to the cement blocks now used. The old smelter of Senator W. A. Clark had retaining walls built of slag, and a conduit for Silver Bow Creek which crosses the property was made of it. The work was carried on with molds formed by



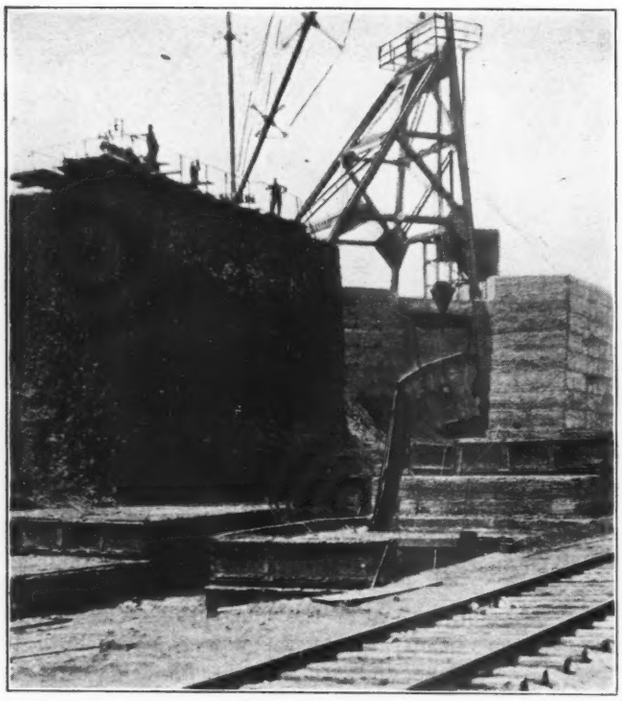
Setting forms preparatory to pouring slag.

cast-iron plates. The East Butte Copper Mining Co. refined the practice and used the waste product in the construction of dust chambers, abutments, settling tanks, retaining walls, and foundations. The side walls of the dust chamber, hopper bottoms, tunnels for removing flue dust, and stack foundations have been made of slag.

As shown in several of the illustrations, the foundation for the headframe of the new shaft is built of slag. Waste bins and ore bins are also made of it. Besides affording a convenient outlet for worthless material, the use of smelter slag provides a massive and substantial construction for the structures in which it is used. Slag ladles, weighing two tons empty and seven tons filled, convey the slag from blast furnaces to place of application. Electric locomotives haul trains of from two to five ladles to the point of construction, where an American steel derrick lifts them carefully from the cars and swings them into position for pouring their contents into the molds. In earlier construction the cast-iron plates used in building the forms were set on top of preceding layers and allowed to lean outward so that the top edge of each layer was vertically above the top edge of the one preceding, but the bottom edge was set in two or three inches. This was done so that each layer would provide a support for the form of the succeeding higher layer as the walls were built, but the practice gave a rough appearance to the work, still noticeable in older construction. Surface roughness has been overcome by using so-called "hairpins" or reinforcing rods bent into the form of a hairpin and buried into the slag at the top of the mold until only a small part of the loop protrudes. The projecting loop serves as a rest for



Form ready for pouring, note tie rail, "hairpins" and reinforcing.



Pouring slag into mold.

the succeeding form, and also supports 8-ft. lengths of rails passed through them to hold succeeding plates in place. The forms are built of cast-iron plates ⅝ in. x 3 ft. x 4 ft., backed by ¼-in. steel plates. Three of them are built into a 3x12-ft. section. The forms are generally 12x24x3 ft., a size that has been found most economical to handle and fill. The form is stiffened by 40-lb. rails and 2½x2½-in. angle iron (see accompanying photographs).

Sampling Practised in Various Stages of the Work

Ore-sampling methods employed by the company are somewhat novel. The ore broken by each individual crew is run into separate chutes after being sorted, and the cars loaded at each chute are tagged—a segregation and identification maintained in loading the skips. The ores from each working place are delivered separately to the collar of the shaft, where they are sampled by a semi-automatic device consisting of a cubical pot holding 60 to 80 lb. The pot is suspended in the path of the ore as it is dumped from the skip and is filled automatically. It is then dumped into a small receiving bin, and at the end of the shift the contents of each bin is run through a small automatic sampling plant provided for that purpose. The samples are assayed quickly, so that as each shift proceeds to work it has a dependable record of the amount and assay value of the ore broken in each individual working place by the preceding shift. The daily aim of each crew of miners is not to produce the greatest possible number of tons of ore but to produce the largest possible quantity of copper, and the work of each shift is judged by the amount of metal produced. This system has been largely responsible for the success attained by the company in its mining operations. One of the disadvantages of the arrangement is the impracticability of using large skip pockets underground for handling ore. This disadvantage is held, however, to be outweighed by the advantage described. Skip pockets are being installed in customary form to handle waste rock from development work but not from ore. It should be noted that two classes of ore are produced: first class, containing a high copper and iron content sent direct to the smelter, and second-class ore, containing a high silica and low iron content sent to the concentrator.

Furnace Operation Efficient

Low-grade ores are concentrated by ordinary jig and table methods of gravity concentration. Tailing is reground, and with the slimes is treated by flotation. Coarse and fine concentrates are mixed with smelting ores in the blast furnace. Although the proportion of concentrates in the charge, and, particularly, the flotation concentrate, is far greater than has been generally considered practicable, furnace operation is efficient and dust losses are normal. The flotation concentrate seems to "ball up" into compact masses in the furnace, which act like solid particles. Results are similar to those obtained by briquetting. Flue dust is sintered by Dwight Lloyd apparatus, which works satisfactorily on all but a small proportion of exceptionally fine flue dust. The latter is mixed with flotation concentrate.

In conclusion I wish to express my deep gratitude for the kindly manner in which the management of the East Butte Copper Mining Co. has aided me in gathering the material for this article. Any merit it possesses is entirely due to their help; its imperfections are my own. I am especially thankful to Mr. Oscar Rohn, general manager; Mr. P. F. Beaudin, assistant manager, and also to Mr. P. F. Minister, the superintendent.

Attempts to Start Shale Oil Industry in Australia Fail

Several attempts have been made in Australia to place the shale oil industry on a commercial footing, but up to the present it has been found impossible, even with the aid of a bonus, to compete with imported oils. The largest deposit of oil shale opened up in Australia is that owned by the Commonwealth Oil Corporation at Newnes, N. S. W. A British company some years ago sunk over £1,000,000 in the venture, but lost practically all its capital. For the past eight years John Fell & Co. have operated the works under an arrangement with the debenture holders, but it is now announced that the extraction of crude oil from shale will cease and that in future crude oil will be imported for refining. Several years ago an attempt was made to retort the shale in place, and, if this had been successful, it would have reduced what is at present one of the principal handicaps—namely, the high cost of mining. Whereas in 1915 it cost only 16s. to secure a ton of shale, the present cost is nearly 44s.

Another company, the Commonwealth Refineries, Ltd., in which the Commonwealth Government and the Anglo Persian Oil Co. each hold half interest, is engaged in erecting a refinery near Melbourne. The original intention was to refine oil from Papua, but as the prospects there did not come up to anticipations the crude oil will now be imported from Persia. It may be of interest to American readers to learn that Plume benzoline is sold in Australia at 26s. per case (8 gal.) and Plume motor spirit at 23s., while the price of Laurel (American) kerosene is 13s. per case and that of Voco Power kerosene 12s. 6d.

Mining Geologists of Note

CHARLES CAMSELL

By J. C. Murray

THE OFFICIAL HEAD of a government technical department who can preserve alike his professional dignity and his personal equilibrium is a rare bird. To achieve immunity from political ptomaine poisoning is in itself something more than notable. Dr. Charles Camsell, Deputy Minister, Department of Mines, Ottawa, has to his credit the fact that he has uniformly refused to play the game of politics for self-advancement. But, being a Westerner, he has sometimes "sat in" and played a weak hand for all and more than it was worth, not for his own aggrandizement, but for the good of his department. Charles Camsell was born Feb. 8, 1876, at Fort Liard, North West Territories. Both place and time are redolent of the true magnetic West—Indians, the fur trade, adventure as a daily routine, and the high colors of pioneering days. Fort Liard lies on the banks of the Liard River, north of latitude 60. The Liard flows north to join the mighty Mackenzie, which empties into the Arctic. The region is not one that nurtures weaklings. Camsell's father was Captain Julian Stewart Camsell, of the Canadian Rifles, Chief Factor of the Hudson's Bay Co. The younger Camsell got his early training at St. John's College, Winnipeg; received his B.A. from Manitoba University in 1894; completed a post-graduate course in geology at Queen's University in 1901; a similar course at Harvard in 1903, and another at the Massachusetts Institute of Technology in 1908.

CHARLES CAMSELL

The period 1894-1900 was spent in exploration of Northwestern Canada. These years were critically formative. The Easterner often affects a passion for the "bush." Camsell, totally without affectation, devoted himself to a country where the average "bush-wise" Easterner would have been a tragic misfit. He knew the idiosyncrasy of the Indian in a way that it has been given few white men to know. In 1901 he became geologist to the Algoma Central Railway, a corporation that owned vast stretches of unexplored, or partly explored, territory in western Ontario. During the two succeeding years he acted as geologist for the Canadian Northern Railway. In 1904 his services were sought by the Geological Survey of Canada. Since then he has gone on from strength to strength. The positions of Director and then of Deputy Minister were not of his seeking. He was the deliberate choice of those in whose hands the powers of appointment lay. Dr. Camsell's published reports are models of lucidity and compactness. They are competent guides to the intelligent prospector. Their writer is essentially practical, his point of view that of the mining geologist, an excellent corrective to the esoteric tendencies of the official geologist. His experience in the West no doubt tended to develop a certain necessary degree of self-reliance. It also endowed him with a broadly tolerant attitude towards life. Camsell is habitually good-humored. As an administrator he has won his spurs, not, I fancy, without giving and taking some shrewd buffets. But of these things nothing is heard outside the offices of the Department of Mines. As an official high in authority he is courteous, considerate, and cheerful. If I have given the impression that Deputy Minister Camsell is an innocuous model of the proprieties I have done him a grievous injustice. He is quick to detect pretense and humbug and is intolerant of them. A great deal of his time and energy is now directed towards the development of export trade in the products of Canadian mines. He has made a close study of the railway freight situation with special reference to mining. His advice and recommendations are sought by the Dominion Government, and this is a most encouraging symptom. The value of his efforts in these directions has already been recognized. Queen's University recently bestowed upon him an honorary doctorate. The Dominion Government selected him last year to conduct a special investigation of mineral markets in Great Britain and Europe. In short, Dr. Camsell is a live wire. He has infused life into his department and he has succeeded in so modifying the character of the work done as to co-ordinate it more closely with the present needs of the nation and with the orderly development of its resources. Ottawa needs more of this kind of man.

CONSULTATION

Properties and Uses of Manjak

"I am interested in learning the nature of the mineral manjak, which is quoted in your market report. Where is it found and what is it used for?"

Manjak is a solid hydrocarbon found in the Island of Barbados. The term is applied to a natural high-grade bitumen occurring there. It is not associated with glance pitch, grahamite, asphaltite, or other asphaltic substances found in Trinidad, Colombia, Venezuela, Peru, Mexico, and in some parts of the United States, but is quite similar to minerals found in Egypt and Syria.

An analysis of Barbados manjak kindly supplied by a producer follows:

	Per Cent
Mineral matter	1.63
Total carbonaceous matter	98.37
Soluble in alcohol	nil
Soluble in petroleum ether	36.37
Soluble in 90 per cent benzol	95.23
Soluble in carbon bisulphide	95.76
Volatile matters on ignition	68.47
Fixed carbon on ignition	29.90
Specific gravity (water at 60 deg. F. equals 1.000)	1.128
Softening point	139.5 deg. C.
Melting point	145.0 deg. C.

Manjak has the appearance of coal, is odorless, hard, and brittle. It is almost pure bitumen. According to W. C. Phalen, manjak is used in the manufacture of preservative paints. It is boiled with oils at high temperatures and converted into compounds for use in painting pipes, boilers, and chimneys. It is usually applied in the liquid state and hardens into a tough rubber-like coating. It makes an excellent insulating material and is impervious to both air and water. In hot and damp climates it is an especially useful preservative.

Phalen notes the use of manjak in connection with rotary drilling for oil. A soft compound is used on the joints of the pipes between the casing threads and drill stem threads, which prevents water, sand, or grit getting into them, thus preventing the parts from being stripped or worn. Not only does it act with particular efficiency in keeping such pipes water-tight and free from corrosion at the joints, but it facilitates the work of joining and separating the pipes, owing to its lubricating quality. Manjak paints are also used in electrical work where conductors require the application of some preservative or protective coating.

According to one producer, the term manjak originated in Barbados and was never used outside of that area until the neighboring island of Trinidad yielded a grade of glance pitch to which the same designation was applied. So far as we know, manjak is not found in the United States, but some bitumens discovered closely resemble it.

The Trinidad deposits of glance pitch occur as thin beds interposed between layers of clay, and are comparatively widespread. The deposits are worked in connection with oil development and exploration. Several shafts have been sunk, and one of them works a 37-ft. seam of the mineral.

In Utah, gilsonite, a coal-black hydrocarbon, is mined. Its resemblance to the manjak from Barbados is quite noticeable.

The Barbados pitch is of a higher qulity than that from Trinidad. The physical properties are not far apart however. The Trinidad material is a soft variety of grahamite and one authority assumes from geological evidence that the deposits on both islands are derived from the same source, by metamorphosis. Trinidad grahamite has a specific gravity of about 1.170-1.175, a melting point of 350 to 438 deg. F., carbon, 84 per cent and fixed carbon 31½ to 35 per cent. The bitumens of both Barbados and Trinidad are exported to the United States that from Barbados commanding the higher price.

The Buyers of Tin Ores

"Being interested in tin from the producers' point of view, we are anxious to obtain dependable data on this metal. Jointly with others, we have acquired a large acreage in New Mexico containing both lode and placer tin. The lode is as yet undeveloped, but we have made a number of tests which satisfy us that stream tin is there in sufficient quantity to make it commercially valuable as a source of tin. Available water will enable us to produce 100 tons of stream tin monthly for several years, and if more water can be developed output can be increased.

"We shall much appreciate any data you can give us on tin ore imported and what is being paid for stream tin or tin concentrate carrying from 70 to 80 per cent metallic tin. Who are the buyers of such ore? What is the freight rate and the best mode of shipping from El Paso to New York by all rail, or part rail and water by Galveston?"

Although small deposits of tin are known to occur in parts of the United States, the amount mined is negligible. In 1921 four tons of tin was the total production of the United States, including Alaska. Activity seems to be confined to the Black Hills of South Dakota. The country has been combed for tin. Particularly during the war was the search intense, when, under the stimulus of high prices, protracted efforts were made to overcome the tin shortage. Therefore it is somewhat surprising to learn of a large discovery of tin in New Mexico.

The tin ore imported into the United States is mainly Bolivian concentrate. During 1921, 15,340 short tons of concentrate was imported. Figures of imports for 1922 are not available, as the Department of Commerce is far behind in its compilation of foreign trade statistics. The price paid for tin ores and concentrates depends upon the metallic content, and, as in the sale of other metallic ores, is generally settled on a quotational basis.

The tin smelter of the American Smelting & Refining Co. at Perth Amboy, N. J., that of the Williams Harvey Corporation at Brooklyn, N. Y., and that of Richards & Co., at Malden, Mass., are the chief producers of tin in the United States. Rail freight rates can be obtained upon application to the railroad serving the district in which you intend to operate.

Recent Patents

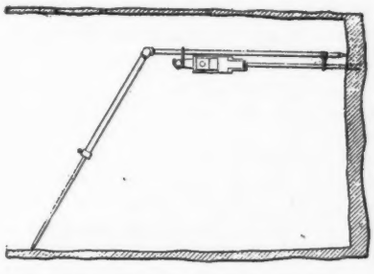
Gold Riffle—No. 1,439,055, Dec. 19, 1922. H. S. Back, Retsil, Wash. A portable rocker box with riffles for recovering gold.

Purification of Solutions by Flotation—No. 1,439,061. Dec. 19, 1922. Walter Broadbridge, Edwin Edser, and W. G. Sellers, London, assignors to Minerals Separation North American Corporation, New York. A soluble solid substance contaminated with insoluble finely divided impurities is dissolved and the impurities are removed by froth flotation. The desired substance is then recovered from the purified solution.

Flotation Agent—No. 1,439,107. Dec. 19, 1922. J. H. James, Pittsburgh, assignor to C. P. Byrnes, Sewickley, Pa. A flotation agent containing a mixture of aldehyde fatty acids.

Oil-Well Sand Trap—No. 1,439,280. Dec. 19, 1922. J. A. Westmoreland, Vivian, La. A sand trap for oil wells including a combined anchor and strainer pipe and suitable fittings.

Standard for Rock Drills—No. 1,439,679. B. B. Brewster, Salt Lake City, assignor to Sullivan Machinery Co. A



hand portable rock drill supported by a standard as shown in the accompanying illustration.

Ball Mill—No. 1,431,475. W. T. Mac Donald, Hayden, Ariz. A ball mill using cubical grinding media.

Disk Pulverizer — No. 1,436,590. Ralph Hush, Johannesburg, Transvaal, South Africa. A design for a disk pulverizer for grinding ore, comprising one fixed and one rotable disk.

Flotation Machine — No. 1,441,560. Jan. 9, 1923. A. H. Connors, Mullan, Idaho. A pneumatic cell with means for delivering the pulp in a plunging stream from above the surface level of the receiving compartment, and means for delivering the flotation agent at the pulp level and in the path of the stream.

Electrodeposition of Copper — No. 1,441,567. Jan. 9, 1923. C. G. Fink, Yonkers, N. Y., assignor to Chile Exploration Co., New York City. An electrode resistent to anodic disintegration and made up of an alloy composed for the most part of copper. Patent No. 1,441,568 covers the application of such an electrode to the deposition of copper from a copper sulphate electrolyte.

Hydrometallurgy—No. 1,441,063. Jan. 2, 1923. Niels C. Christensen, Salt Lake City, Utah. Ores containing sulphides of lead, silver, and copper are treated with a hot concentrated solution containing ferric chloride to dissolve the desired metals as chlorides, after which they are precipitated. Patent No. 1,441,064 covers the method of heating the solution. Patent No. 1,441,065 covers the treatment of carbonate ores of lead. The lead is dissolved by a warm concentrated salt solution containing ferric chloride, and substantially one-third of the dissolved lead chloride precipitated by cooling; the balance of the lead is obtained by electrolyzing the solution with an iron anode. The recovered lead chloride is electrolyzed in a molten condition with an inert anode to separate the lead and chlorine. The chlorine thus secured is mixed with the solution containing ferrous chloride, ferric chloride thus being obtained, which is used to lixiviate more ore.

Patent No. 1,441,072. Jan. 2, 1923. Frank E. Elmore, Boxmoor, England. Lead-zinc sulphide ores or concentrates are heated with sulphuric acid, which converts the lead sulphide into a lead compound soluble in a substance which will not dissolve zinc sulphide. The lead is then dissolved from the residual zinc sulphide.

Grinding Mill—No. 1,440,000. Dec. 26, 1922. F. D. Bradley, Goldfield, Nev. A tube mill with a partition in the middle, dividing the mill into two separate grinding chambers.

Electric Smelting—No. 1,440,106. Dec. 26, 1922. E. H. Rothert, Seattle, Wash. An electric smelting furnace with reducing electrodes, and ore-roasting containers heated by gases from the furnace. A screw conveyor is provided for transferring the roasted ore to the furnace chamber.

Flotation Machine — No. 1,440,129. Dec. 26, 1922. W. O. Borcherdt, Austinville, Va., assignor to the New Jersey Zinc Co., New York City. A design for a pneumatic flotation machine involving a special method of adjusting the pulp flow.

Hydrometallurgy of Copper — No. 1,440,186. Dec. 26, 1922. H. L. Sulman, T. J. Taplin, Jr., W. G. Perkins, and H. F. K. Picard, London, England, assignors to Harold Wade, London, England. Crushed ores containing oxidized copper compounds are heated in a reducing gas to reduce the copper and subsequently leached with an ammoniacal solvent.

Roasting Furnace — No. 1,440,533. Jan. 2, 1923. C. G. Fink, Yonkers, N. Y., assignor to Guggenheim Bros., New York City. Heat is conducted and distributed through a roasting furnace of the multiple-hearth type by making the arches and interior walls of an alloy of iron and chromium containing not less than 30 per cent and not more than 60 per cent of chromium.

Concentrating Table—No. 1,442,186. Jan. 16, 1923. E. A. Sperry, Tientsin, China. A rectangular concentrating table with diagonal riffles.

Technical Papers

Mineral Resources — Recent additional publications in the Mineral Resources series issued by the U. S. Geological Survey, Washington, D. C., and obtainable on request, include: "Stone in 1921," pp. 38; "Gold and Silver in 1921," pp. 37; "Gold, Silver, Copper, Lead and Zinc in Idaho and Washington in 1921," pp. 29; "Manufactured Gas and Byproducts in 1920," pp. 58; "Sulphur and Pyrites in 1921," pp. 5; "Cement in 1921," pp. 14; "Mineral Waters in 1921," pp. 8; and "Gold, Silver, Copper, Lead, and Zinc in Nevada in 1921," pp. 30.

British Columbia Mining — Memoir 132 of the Canadian Geological Survey, Ottawa, Ont., pp. 81, describes the "Geology and Ore Deposits of Salmon River District, British Columbia." It is illustrated by photographs, sketches, and a colored topographical map. It will be sent on request.

Canadian Mining—The report of the Department of Mines for the year ending March 31, 1922, pp. 48, describes the work of the Canadian Government mining bureaus for the year. It may be obtained from the department at Ottawa for 5c.

New Brunswick Geology—The "Geology of the Moncton Map-area" is described in Memoir 129, pp. 69, illustrated with plates and colored topographical maps, and obtainable on request from the Canadian Geological Survey, Ottawa, Ont.

Ontario Mining—The Blanche River area, in Ontario, lies between the Cobalt and Kirkland Lake districts, and contains several mineral prospects of promise. These are described and the area mapped in Part III of the thirty-first annual report of the Ontario Department of Mines, Toronto, Ont., pp. 22, obtainable on request.

Mineral Fuels—Bulletin 726 of the U. S. Geological Survey, Washington, D. C., pp. 332, with numerous separate plates, contains seven papers on oil, gas and lignite fields in various parts of the country, that have been published previously as separates. It is obtainable from the Survey on request.

South African Salt—Memoir 20 of the Geological Survey of South Africa, Pretoria, pp. 136, with colored plates, price 7s. 6d., discusses "The Pretoria Salt-Pan: A Soda Caldera."

Blast Roasting—In *Chemical Engineering and Mining Review* for Nov. 5, 1922, (Melbourne, Australia; price 11d.) appears an article on blast roasting of silver-lead ores, the paper being one that was read before the Australasian Institute of Mining and Metallurgy at Port Pirie in September. The article (pp. 7) describes the roasting practice, in Dwight-Lloyd straight-line machines and 10-ton H.-H. pots, as practiced at the Port Pirie works of the Broken Hill Associated Smelters, Proprietary, Ltd.

SOCIETIES, ADDRESSES, AND REPORTS

Relations Between Mining School and Industry Discussed

President McNair of Michigan College of Mines Addresses Engineers at New York Meeting

Dr. F. W. McNair, president of the Michigan College of Mines, Houghton, addressed a joint session of the American Institute of Mining and Metallurgical Engineers and the Mining and Metallurgical Society of America in New York, Feb. 21, on "Relations Between the Mining Industry and the Technical Colleges." He said in part:

"A new and greatly enlarged conception of the engineer's relation to humanity and of his importance to civilization is dawning in the public mind. It begins to become evident that the man who is to lead must have a broader training and a much broader outlook on life than is given to the more or less specialized engineering student now in college.

"It ought to be recognized by everybody that what the young graduate knows, his knowledge of specific facts, or the skill he may have developed in any branch of the industry at graduation, or both are of vastly minor importance. That which really counts both to him and to the employer, who is interested in the man beyond the passing moment, are such attributes as his possession of an alert and well-disciplined mind familiar with the fundamental facts and the processes of thought which underlie successful technical practice, and his capacity for quickly acquiring the specific knowledge and skill which his immediate task demands. At any moment the things he knows count for little, while his ability to work, to think, to attack problems effectively, counts for much.

"There seems to be a general consensus of opinion that the training of the would-be engineer can be, and of right ought to be, made much better than it is now. As a first step toward such a goal, there should be brought about a clear mutual understanding as to desirable and feasible relations between the men in the industry and those who are training men for the industry. The existing relations, it seems, are too haphazard. What is needed is a definite getting together and frank interchange of views, and, as far as may be, an agreement as to what the college on one hand and those in industry on the other can do to improve conditions.

"A co-operative attempt to determine and formulate efficient methods for taking into and developing in the industry the graduate as he starts his career would be helpful both to the industries and to the colleges. The men in industry would gain a better understanding of what the college graduate now is; also of some of the limitations and difficulties with which the colleges must contend in training him, and would be, therefore, in much better position to help by specification, by suggestion as to methods, and otherwise, to make the college more successful in meeting the legitimate demands of industry.

"But, pending the advent of the ideal engineering school, the present institutions must without doubt modify their curricula and methods to meet more nearly modern demands which are already upon them. Just how this is to be done, just what direction the modifications are to take, are not at all clear to everyone concerned. Even where college authorities are quite clear as to what ought to be accomplished, there appear formidable obstacles to proposed changes, and some there are who seriously doubt that much in the way of change is at present possible.

"Two notable movements to meet this situation have made their appearance in the last year. The first of these is sponsored by the National Industrial Conference Board, which in co-operation with the Society for the Promotion of Engineering Education established a little less than a year ago a joint advisory committee on engineering education. The committee is made up of eight gentlemen having large responsibilities in industry and a like number from the engineering colleges of the country.

"At present this committee is devoting its energies largely to setting forth the need for co-operation between the industries and the engineering colleges. It has held two notable meetings. At its June meeting a resolution was offered by the industrial members of the committee, the wording of part of which is significant. I quote, 'In the opinion of this committee it is vital to the continued success of American industry that there be established quickly a much closer co-operation between the engineering colleges and industry than at present exists.'

"The other movement is in and by the colleges. It had its inception at the summer convention of the Society for the Promotion of Engineering Education. This society appointed a committee known in its records as the 'Development Committee,' whose purpose was to answer as far as might be the question, 'What can the society do to develop, broaden, and enrich engineering education?' In its report, this committee outlined an ambitious scheme, the work under which is to be largely done by the engineering colleges themselves. This work involves broad and fundamental investigation and research.

"In part, it is also the function of this board to stimulate the study of engineering education in the broadest possible way by agencies other than the colleges themselves, and to co-ordinate the results so obtained with those from the colleges. The whole scheme looks toward the development of the engineer of the future, a man who will be an effective leader in civilization."

New York Section of A.I.M.E. Elects Officers

The annual meeting of the New York Section of the A.I.M.E. was held at the Chemists' Club recently, and was preceded by the usual dinner. The program was given in Rumford Hall. R. W. Raymond opened the meeting, and after the minutes and financial reports had been read, E. P. Mathewson presided. The present anthracite and bituminous coal situation was discussed by H. Foster Bain, E. W. Parker, Samuel A. Taylor, Roderick Stevens, and R. C. Morris, Jr. George Otis Smith outlined the work being done by the Federal Coal Commission.

Ballots for the officers for the ensuing year were counted and announced. The following were elected: Chairman, Bradley Stoughton; vice-chairmen, Karl Eilers and John A. Church, Jr.; treasurer, D. E. A. Charlton; and committeemen, H. N. Spicer and Forrest Rutherford.

Engineering Council to Discuss Government Reorganization

A meeting of the executive board of the American Engineering Council, the executive body of the Federated American Engineering Societies, has been called for March 23-24 in Cincinnati. Government reorganization and reforestration will be among the chief questions to be discussed.

Co-operation of the government and the federation in a nation-wide campaign to conserve the country's forests is also announced by Dean Cooley, following a conference with Colonel W. B. Greeley, chief of the U. S. Forest Service. It is planned to enlist engineers in all parts of the country in the reforestration movement, with the aid of the state forestry services, organizations of farmers, universities, railroads, and other bodies.

Gulf Coast Oil Producers Elect Officers

A meeting of the directors of the Gulf Coast Oil Producers' Association was held in Houston, Texas, on Feb. 24, at which officers were elected for the ensuing year. The new officers are: R. L. Young, re-elected president; J. C. Wilson, vice-president; D. J. Harrison, second vice-president; T. L. Smith, Jr., re-elected secretary and treasurer.

M.M.S.A. Meets in New York

The New York Section of the Mining and Metallurgical Society of America met at the Harvard Club on Feb. 7. The topic of the evening was "Relation of Government Bureaus to Industry."

MEN YOU SHOULD KNOW ABOUT

Stanly A. Easton is at Washington.

W. J. Loring is on his way to Boston and New York.

J. Mackintosh Bell, of the Keeley Silver mines and the Vipond Consolidated, has returned from England.

N. O. Lawton, of Salt Lake City, is making a two weeks' business trip to New York.

Spencer Bishop has gone to Matehuala, Mexico, on business for the American Smelting & Refining Co.

N. H. Getchell, general manager of the Betty O'Neal Mines Co., operating near Battle Mountain, Nevada, is in San Francisco.

O. B. Hofstrand, metallurgical and industrial engineer, with offices in Salt Lake City, Utah, is in New York City on business.

Charles E. Knox, president and general manager of the Montana Tonopah Co., Reorganized, has returned to Tonopah from New York.

John Melhase, geologist, is making an examination of the water resources tributary to the Southern Pacific R.R. in Arizona and New Mexico.

Philip Wiseman and C. H. Palmer, Jr., president and vice-president, respectively, of the United Eastern Mining Co., are visiting the El Tigre mine, at Nayarit, Mexico.

Orr R. Hamilton, chief of the metals valuation section of the Bureau of Internal Revenue, announces that he is leaving governmental service to resume private consulting practice.

R. V. Ageton, of the Bureau of Mines staff, has gone to Picher, Okla., to work with Dr. F. Flynn, of the Public Health Service, on a study which is being made of dust conditions in zinc and lead mines.

Elmer H. Finch, who recently resigned from the position as geologist for the Texas Co., sailed for Guatemala on Feb. 26. He will be in that country for a short time, with headquarters at Hotel Grace, Guatemala City.

Leon D. Conklin was elected president of the Montana Society of Engineers when it met in joint session with the Montana Section of the American Institute of Metallurgical and Mining Engineers.

Harold W. C. Prommel, who has been for the last five years associate geologist with the petroleum engineering firm of Fisher & Lowrie, of Denver, Colo., has recently opened offices in Denver as consulting geologist.

C. A. Myers, of Nashwauk, Minn., manager of the York Iron Mining Co., has resigned, effective March 1. Mr. Myers has been with the Coates & Tweed interests for the past seven years, and first superintended the opening of the Plymouth pit at Verona, Mich., Gogebic Range.

Charles F. Rand has been re-elected chairman of the Engineering Foundation, which is directing, in co-operation with the National Research Council, a national program of industrial research. **Edward D. Adams** was chosen first vice-chairman, and **Frank B. Jewett,** second vice-chairman; **Joseph Struthers** is treasurer and **Henry A. Lardner,** assistant treasurer.

R. A. Bowen, of Hurley, Wis., has been appointed superintendent of the Bristol mine, operated by Oglebay, Norton & Co., at Crystal Falls, Mich., succeeding the late Arvid Bjork. For about a year Mr. Bowen has been assistant superintendent for the company on the Gogebic Range.

Mining and metallurgical engineers visiting New York City last week included: **B. C. Yates** and **A. B. Yates,** of Lead, S. D.; **A. T. Ward,** of Havana, Cuba; and **F. C. Giebert,** of Denver.

SOCIETIES, ADDRESSES AND REPORTS

The American Society of Mechanical Engineers will hold the spring meeting at Montreal on May 28-31.

The spring meeting of the **American Chemical Society** will be held with the New Haven and Connecticut Valley Section, at New Haven April 2-7. The dedication of the Sterling Chemistry Laboratory of Yale University will be held on April 4.

OBITUARY

George Shopley Downing, assistant superintendent of the Argonaut mine, died the last of February. Mr. Downing exerted himself to the utmost during the work of rescue at the Argonaut disaster, and his death was caused by the exposure which he underwent at that time.

P. J. Gearon, of Wallace, Idaho, died suddenly in Spokane on Feb. 16. Mr. Gearon, born in Freeport, Ill., started West when fifteen to seek his fortune. He joined the gold rush to the Murray district in Idaho, where he staked a claim in 1883. He since has been identified continuously with mining in that district.

Captain James Hoatson, aged seventy-six, a director of the Calumet & Arizona Mining Co., died at Hollywood, Calif., on Feb. 27, after a short illness. Captain Hoatson was a pioneer miner of the Montana, Michigan, and Arizona copper fields. It was on his recommendation that the original Calumet & Arizona claims were taken over by a group of Lake Superior and Pittsburgh men and developed. He also organized the North Butte Mining Co., of which he was president for many years.

Dr. Harry Harkness Stoek, who has been head of the department of mining engineering at the University of Illinois, died at Urbana on March 1. Dr. Stoek was born in Washington, D. C., on Jan. 16, 1866. He received his early education in the public schools of that city, graduating from the Central High School in the first class to graduate from a high school in the national Capital. In 1887 he was graduated from Lehigh University with the degree of bachelor of science in mining, and in 1888 received the degree of engineer

Dr. Harry H. Stoek

of mines. During the summer of 1885 he served as assistant in the Department of Mineralogy in the National Museum in Washington, D. C., and during the summer of 1887 was U. S. Government Inspector of Dredging on the Thames River, Connecticut. From June, 1888, to January, 1900, he was assistant engineer of the Susquehanna Coal Co., Wilkes-Barre, Pa. From January, 1900, to June, 1903, he instructed in mining, metallurgy, and geology at Lehigh University, in charge of all mining and metallurgical design and visits of inspection to furnaces and mines. The summer of 1901 was spent in examining iron properties in North Carolina, and the summer of 1903 was spent inspecting the copper and iron mines of Michigan and Minnesota. From January, 1898, to September, 1909, he was managing editor of *Mines and Minerals,* at Scranton, Pa., and in an editorial capacity Professor Stoek visited most of the mining regions of the United States, gathering material for articles by means of careful personal studies of the mines. During this period Professor Stoek gave courses of lectures upon mining at Brooklyn Polytechnic Institute, Sheffield Scientific School and Pennsylvania State College. He was a member of several scientific societies and the author of many publications on mining engineering and of technical papers for the U. S. Bureau of Mines.

THE MINING NEWS

The Mining News of ENGINEERING AND MINING JOURNAL-PRESS is obtained exclusively from its own staff and correspondents, both in the United States and in foreign fields. If, under exceptional conditions, material emanating from other sources is published, due acknowledgment and credit will be accorded.

Leading Events

PLANS are virtually perfected whereby the Kennecott Copper Corporation will get control of the Utah Copper Co. Large holders of Utah stock will exchange shares for Kennecott shares on the basis of 1 for 1¾.

The Granby Consolidated company has announced officially the immediate erection of a $500,000 concentrator. This makes a total recent investment for improvements of $1,200,000.

Tungsten mining is being resumed at Boulder, Colo. Wolf Tongue custom concentrator will start.

The rich ore in the Tom Reed mine, at Oatman, Ariz., forecasts a "come-back" for the old bonanza.

The Phelps Dodge Corporation has set ahead the date for starting the Copper Queen concentrator. It is now planned for April 1.

Stoping will be started at once in the Black Bear mine, in Colorado, to supply the Coolbaugh-process plant at Durango.

C. M. Schwab interests will exploit "wet" zinc-lead areas in Quapaw reservation, in Oklahoma.

The Betty O'Neal company is doubling the capacity of its 100-ton plant near Battle Mountain, Nev.

Week's shipments from the Tintic district in Utah break record.

Kennecott Plans Trade for Utah Copper Control

Large Utah Stockholders Will Exchange 1 Share for 1¾ of Kennecott—Utah Dividend Increased—Kennecott Expected to Follow Suit

PLANS have virtually been agreed upon whereby large stockholders in the Utah Copper Co. will exchange their shares for shares in the Kennecott Copper Co. on the basis of 1 of Utah for 1¾ of Kennecott. No action by Utah as a corporation will be necessary, but the Kennecott directors will have to submit the plan to their stockholders for ratification. They also will ask authority to increase the capital stock of the company sufficiently to put the plan into effect. If the present program is carried out there will be no formal merger, but Kennecott will control the Utah Co. by virtue of ownership of a majority of the stock. It already holds 616,000 shares in its treasury, or more than one-third of the outstanding stock. Utah stockholders will make the exchange as individuals.

The deal will give Kennecott control of a potential production of at least 50,000,000 lb. of copper per month. The company already controls the Mother Lode and Braden properties, and as Utah copper owns more than half of the outstanding Nevada Consolidated shares, the production of all of these will be directed by Kennecott officials. It is understood, however, that no change will be made in the executive and operating personnel of either Utah or Nevada Consolidated as a result of the change in control.

The Utah directors last week increased the dividend rate for the current quarter from 50c. to $1 a share, thus placing the stock on a $4 annual dividend basis. Rumors had been circulated in the financial district for several days that such action was probable. The dividend is payable March 31, to stock on record March 12.

The increase in the Utah Copper dividend, according to financial opinion, presages an increase in the quarterly dividend on Kennecott stock, as the Kennecott income is greatly increased by receipt of larger dividends from its Utah stockholdings.

Only recently Kennecott resumed payment of dividends at the rate of 75c. a share quarterly or $3 annually. The Kennecott directors are expected to declare a quarterly dividend of $1 a share at the meeting soon to be held.

Under the basis of exchange, it is pointed out, Utah stockholders, who now receive $1 a share quarterly, will in exchange receive 1¾ shares of Kennecott, thus increasing their dividend return. This is expected to stimulate the desire on the part of Utah stockholders to exchange their securities.

The following estimate gives an approximation of current rate of earnings by the Kennecott company:

Profit from Alaska operations, $4,500 000; Braden earnings after interest, $8,500,000; Utah Copper dividends, $2,466,000; Mother Lode dividends, $1,275.000.

With Kennecott at 44½ and Utah at 76½, the two stocks are selling close to the rumored basis of exchange. Kennecott has outstanding 2,795,728 shares, of an authorized issue of 3,000,000. To make the exchange suggested, it will be necessary to increase Kennecott's authorized capital, in round figures, by 1,750,000 shares. This would give it a total authorized of about 4,750,000 shares, which is an exceptionally large capitalization compared with that of other copper companies.

Picher Concentrator Burns to Ground in Forty Minutes

Fire, supposedly starting when a torch on a gas engine temporarily lost its flame, totally destroyed the mill of the Mogul Mining Co., situated 1½ miles east of Picher, Okla., an Feb. 27.

Prompt service from the Picher fire company was obtained, but a high wind helped the blaze, and the plant was burned to the ground within forty minutes after the fire started. The hoisting engine in the mill-shaft derrick fell into the sump of the shaft.

The mine has been producing about twenty tons of zinc concentrate per shift, being one of the steady producers of the field. E. E. Wilson, of Miami, Okla., is president of the company. The mill will be rebuilt immediately. The loss was estimated at $90,000, and insurance carried was $25,000.

Rhodesian Gold Output

By Cable from Reuters to "Engineering and Mining Journal-Press"

London, March 5.—The output of gold in Rhodesia during January totaled 56,630 oz.

Cost of Granby Improvements at Anyox Will Total $1,200,000

Dam and Hydro-electric Plant Near Completion — Concentrator Construction Authorized

By Robert Dunn

H. S. Munroe, general manager of the Granby Consolidated Mining, Smelting & Power Co., has stated that the proposed new concentrating mill at Anyox, the company's smelting center, will be constructed, that it will cost approximately $500,000, and that it will be ready for operation early in 1924. Work will start this spring, and the mill will have a capacity of between 1,200 and 1,500 tons of ore a day. Several million tons of ore, which it is not economical to treat by smelting direct, are said to be blocked out and ready for mining as soon as the additional plant is in condition to handle it. With the completion of the mill it is expected that one furnace of the smelter will be closed down. The concentrator will be situated on the side hill overlooking the water and below the present "high line" railway track. The ore first will be crushed by large crushers now in place at the mine, and thence transported over the "high line" railway. A fine-crushing plant will reduce it further and conveyors then will transport the material to storage bins at the head of the mill. Oil flotation will be used, the plant consisting of a crusher building, conveyor system, concentrator building, dewatering tanks, and filter building. The plant will be designed for an ultimate capacity of 3,000 tons, in three units of 1,000 tons' nominal capacity. Construction work on the first unit will start as soon as plans can be drawn and material assembled. In order to handle the concentrates certain changes will be made in the smelter, which may include the erection of a new sintering plant. Machine shops, electric shop, and foundry will be altered or enlarged more efficiently to care for the construction work in view.

Recent construction, together with that projected, in connection with the Anyox plant, involves an expenditure of about $1,200,000. This figure is obtained by adding the estimated cost of the new mill, $500,000, to that of the almost completed storage dam, which runs to nearly half a million, and that of an addition to the hydro-electric plant at No. 1 Power House, which approximates $200,000. These works seem to assure the permanence of Anyox as a mining center.

Apropos of the acquirement by the Granby company of the mine and mill of the Canadian Copper Co. at Copper Mountain, the question is being asked whether the concentrates from the Allenby mill will be shipped to Vancouver or Seattle and thence conveyed to the Anyox smelter in the same boats that bring the output of the Anyox plant south, or whether other arrangements will be made for the disposition of the ore produced from the Copper Mountain mine.

Hollinger Will Increase Mill Capacity to 7,500 Tons

The Hollinger Mine, of Porcupine, Ont., announces that it will start this spring with its proposed increase in milling capacity. The present mill, which has a capacity of 4,500 tons a day, will gradually be brought up to 7,500 tons. Plans are already under way to bring the crushing capacity to 10,000 tons daily, and the cyanide tankage will also have to be enlarged. Some of the machinery has already been ordered and the rest will be ordered soon.

Starting Date of Copper Queen Concentrator Set Ahead— Now April 1

G. H. Dowell, manager of the Copper Queen Branch of the Phelps Dodge Corporation, at Bisbee, Ariz., announced the first unit of the company's new concentrating mill at Warren would be placed in operation April 1, instead of May 1, as was formerly announced. The other three units of the 4,000-ton mill will follow at intervals of about two weeks each. Work to complete the equipment of the new mill is being pushed to the utmost. Most of the belting has arrived and is rapidly being installed. Construction of the launders is going on rapidly, and it is believed that all will be in readiness by April 1. Extra steam-shovel and railway equipment is being pressed into service, as it has been decided to remove the remaining sections of the overburden at the southwest edge of the pit.

Charles M. Schwab Interests Awarded Quapaw Leases in Oklahoma

Will Develop Section Hitherto Handicapped by Excessive Water—Eagle-Picher Gets Adjoining Ground

George W. Moore, of Joplin, local representative of the Charles M. Schwab interests in the Tri-State field, has been notified that the Schwab interests have been awarded the leases in the Quapaw section by Secretary of the Interior Fall, at Washington. The Eagle-Picher Lead Co. also had applied for the leases.

The leases extended from the Wolverine lease on the west to a half mile east of Quapaw, and from a half mile south of the town to the Royal and Coyne mines north of the town, comprising in all about 2,600 acres. The Eagle-Picher company had asked for leases of approximately 5,000 acres, and it is expected it will be given the remainder of the acreage.

Awarding of the leases will bring about the immediate development of the Quapaw section on a scale never before attempted. It has always been too badly handicapped by excessive water to be successfully developed by small companies.

The Schwab interests are represented locally by the Quapaw Mining Co., to which the leases have been awarded and which will have charge of all operations.

Officials Suspect Incendiarism in Coeur d'Alene Mines

Circumstances of Two Recent Fires Peculiarly Alike — "Radicals" May Be at Work

By A. J. Dunn

Although fires have not been unknown in the mines of the Coeur d'Alene district of Idaho, the circumstances surrounding their occurrence have not heretofore been such as to suggest incendiary origin; nor was there a suspicion of that kind a few weeks ago when a fire in the Morning mine, owned by the Federal Mining & Smelting Co., caused the death of three men and imposed a heavy loss upon the company. But hardly had the fire in the Morning been extinguished and normal operations resumed when another fire, in the Hercules mine, occurred under similar conditions. Fortunately no lives were lost in this case, and at this writing, about a week after the fire was discovered, the fire seems to be under control, but by the time the mine is freed from gas and made safe for workmen fully two weeks will have been lost. If this fire and that at the Morning were due to usual conditions, in underground operations, say defective wiring or careless handling of carbide lamps or candles, it is at least singular that they occurred so close together in point of time and under such similar circumstances. The fact is, the situation gives ground for suspicion that these fires were the work of an incendiary.

The mines of the district are operated under the open-shop plan, and the system by which employees are selected is a safeguard against members of the I.W.W. and other "radicals" who resort to such methods. But after all precautions are taken, it is possible in the constant turnover of hundreds of men for a radical of the fire-brand type to get into the mines, and it is not improbable that herein lies the explanation of the fires in the Morning and Hercules mines. Officials are making no accusations, but they are suspicious.

U.V.X. Wants $4 Rate on Copper From Clarkdale to Pacific

A hearing for the reduction of freight rates on copper bullion to the Pacific Coast is being conducted at Phoenix fore John Mooney, examiner for the Interstate Commerce Commission. The case was instigated by the United Verde Extension Copper Co. and James A. Douglas, president of that company, was the first witness. A request has been made by the company for a flat rate of $4 per ton on bullion shipped from the smelter at Clarkdale to Pacific ports. Mr. Douglas recited conditions that he said made it necessary for his company to ask for that rate in order to ship by water from coast points. It is contended that the $4 rate is a fair one as compared with the rate charged for shipment of bullion from Salt Lake City to the coast. The establishment of this rate would permit Arizona pro-

ducers to compete with Chile and Peru in the Oriental and European markets, and such opening to foreign markets would treble the output of the state and encourage development of mineral resources, witnesses declared. H. M. Tooker and C. E. Blaine, rate expert for the Southwestern Traffic Bureau, and Superintendent Kline, of the United Verde Extension Railroad, also appeared for the plaintiff. It is expected that the decision in this issue will affect rates from all Arizona points to the rates from all Arizona points to the coast as the schedules are interdependent.

Lessees Ship Regularly From Tombstone, Old Arizona Camp

New Mill Being Erected — Bunker Hill Produced 70 Cars During January

The Tombstone district, of Arizona, is experiencing greater activity than at any time since the old Tombstone Consolidated and others were operating at full blast more than twenty years ago. The many leasers operating mines on the old property, which is now owned by Phelps Dodge Corporation, Bunker Hill branch, are making capacity output, and many other producers owning or leasing properties in the district are hastening the mining of rich silver ores while the government price for the metal is maintained.

A 50-ton mill is being installed on the Bonanza property, which is owned by J. L. Melgren and leased to Wooton, Hilton, and Jacobson. This property consists of 52 claims and is situated near the State of Maine property. Numerous veins are exposed at the surface, and a large dump of ore is stacked at one of the shafts. One 500-ton lot averages $40. Cyanide tanks are already in place, and it is expected that the mill will be ready to operate within a short time.

The Ingersoll mine, which is leased by Fred Sutter, of Bisbee, and owned by the Hearst estate, of San Francisco, reports the intersection of two high-grade veins of silver ore on the 400 level. At this property, ore is being stoped from under the surface of an adjoining claim, owned by other interests. The Ingersoll company was granted right to the ore by the court, in an apex case of the early days.

Shipments from the mines of the Bunker Hill group, which are operated by lessees, amounted to 70 cars during the month of January, according to A. M. Morris, superintendent. This production, which is about 20 cars in excess of that for the previous month, is expected to be maintained. The lead-silver ores are shipped to the El Paso smelter, while the copper-silver ore is shipped to the Copper Queen smelter at Douglas.

Silver Comes Fast; 2,691,000 Oz. in One Week

Purchases of silver by the Bureau of the Mint during the week ended March 3 amounted to 2,691,000 fine ounces. This brings the total purchases under the Pittman Act to 162,187,674 fine ounces.

Tungsten Mining at Boulder, Colo., Will Be Resumed

Wolf Tongue Co. Will Start Customs Plant—Base Price $10 per Unit for 60 per Cent Product

The Wolf Tongue Mining Co., formerly one of the largest tungsten operators in Colorado, which closed down its mines and mill in 1918, resumed operations in the Boulder district March 1. The company will work the Cold Spring mine, and its other properties will be operated by lessees as fast as arrangements can be made to take them over. A large number of prospective lessees have made application for blocks of ground, and it is expected that more than 100 men will be at work on the company's property before the end of the month.

The Wolf Tongue concentrating mill will start about April 1, but ore will be purchased as fast as offered on a schedule based upon a price of $10 per unit for a 60 per cent product.

So far as known, the Wolf Tongue is the first tungsten-mining company to resume operations in this country since the general shutdown following the armistice. The Colorado company is a subsidiary of the Firth-Stirling Steel Co. of McKeesport, Pa., and the product of its mill will be in the form of concentrates shipped to the steel mills of the latter company. The ore is in the form of ferberite, and much of it of a grade that does not require concentration. Manager Loach announces that the company will make contracts for the purchase of ore during the present year to the extent of 5,000 tons, equivalent to a 60 per cent product.

With a ready market for the ore at the present schedule there will be a general revival throughout the Boulder district, and it is expected that many small mines will resume operations during the next sixty days.

Line-up for "Apex" Litigation in Mines at Randsburg, Calif.

Development by Many Companies Progresses—Equipment Is Installed

The apex litigation between the California Rand and the Randsburg Silver Mining Co. will be set for a hearing in the Federal Court at Los Angeles in the fall. W. E. Colby, attorney; Albert Burch, W. H. Wiley and Fred Searls, Jr., are retained by the California Rand, and John Grey, H. V. Winchell, L. W. Wickes, and R. N. Hunt are retained by the Randsburg Silver Mining Co. The Randsburg Silver Mining Co. has stopped shipping and development upon the disputed veins, is sinking two new shafts north of the No. 6 shaft of the California Rand, and is crosscutting on the 800 level of the Fox shaft.

To the east of the new shafts, the Rand Consolidated is sinking a shaft on the Big Four group. Hoisting and compressor equipment has been installed, and it is planned to sink 1,000 ft. The company is financed in part by men interested in the California Rand.

The shaft of the Johannesburg Mining & Milling Co. on the Silver King group encountered the schist at 500 ft., and between 600 and 700 ft. cut several small but rich stringers of ore. Heavier equipment is being installed, and a station is being cut at the 700 level. Although only one mine is producing, new shafts are being started each month.

New development in the property of the California Rand mine is principally on the lower levels. An 8-ft. orebody recently opened up by the north drift on the seventh level is being stoped and the ore shipped. No. 2 shaft has reached a depth of 930 ft. No. 6 prospect shaft on the north end of the company's holdings entered the schist formation at 500 ft., and at 600 ft. intersected a vein. The mill is handling 350 tons per day.

A. S. & R. Co. Has Good Accident Record

Only 2.89 Days Lost per 1,000 Hours Worked at Eighteen Plants

The operation during the year 1922 of the eighteen smelting and refining plants of the American Smelting & Refining Co., in the United States, was accomplished with a low percentage of accidents and of time lost because of injury to workmen. Statistics just completed by the company's Department of Safety, Labor, and Welfare show that in 1922 the days lost on account of accidents was 2.89 per 1,000 hours worked at all plants. The accident rate was 77 per 1,000 employees working 3,000 hours.

The above returns of safety in operation surpassed the record for any year but one since the establishment of the company's Safety Department. The best safety record was made in 1921, when the time lost through mishaps was 2.63 per 1,000 hours worked and the accident rate was 63 per 1,000 employees working 3,000 hours. However, owing to much larger activities at various plants in 1922 compared to 1921, there were increased possibilities of mishaps due to taking on new men unfamiliar with the hazards. The actual slight rise in the 1922 lost time and accident rates is thus accounted for.

The improvement resulting since the creation of the Safety Department is indicated by the fact that in 1914 the time lost through casualties was 5.57 days in each 1,000 hours, or almost 100 per cent greater than last year's rate.

The accident rate in 1914 was 233 for each 1,000 employees working 3,000 hours, that rate being 200 per cent greater than the 1922 rate.

Among the individual safety records the Murray (Utah) plant made the best showing, with only 0.37 of a day lost through accidents per 1,000 hours worked. The East Helena (Montana) plant had the lowest accident rate, 21 per 1,000 employees working 3,000 hours. The company's safety pennant for 1922 was awarded to the Murray plant. The safety pennant, introduced as a "sporting feature," has greatly stimulated a friendly but keen rivalry among the plants and competition in accident prevention has always been very strong.

Feldspars, Ltd., Resumes Shipments from Richardson Quarry

Property in Ontario Canada's Largest Producer of Feldspar—Sorting Plant Planned

BY J. C. MURRAY

The Richardson feldspar quarry, near Kingston, Ont., owned and operated by Feldspars, Ltd., has resumed active shipping of high-grade and No. 2 feldspar. At present the shipments amount to about 100 tons per week. This quantity will be increased soon. During the last twenty years, more than two-thirds of all feldspar produced in Canada came from the Richardson mine but it has been idle for some months pending the completion of a spur railway.

The quarry is situated 26 miles north of Kingston, near Godfrey Station, on a branch of the Canadian Pacific Railway. From Godfrey a spur line is built to within two miles of the property. The connecting link is a recently completed, macadamized, wagon road, constructed by the Ontario Department of Public Works.

The body of feldspar on which nearly all the work done to date has been confined, is a huge, irregular lens, 150 ft. wide, 400 ft. long, and proven to a depth of 140 ft. It is a sharply defined pegmatitic segregation, dipping slightly to the northwest, and limited by clean walls of granite-gneiss. The mass is feldspar, diluted by a fractional percentage of quartz inclusions. The greater part of the mass is spar of high grade, containing little iron in any form, a small amount of uncombined silica, rare spicules of tourmaline and hornblende, and rarer flakes of mica. Near the walls narrow zones of feldspar are contaminated with the minerals above mentioned. From these zones a good No. 2 spar is obtained by hand cobbing.

From the pit there has been taken out a total of 500,000 tons of spar, quartz, and waste. Of this large total, approximately half was shipped as high-grade feldspar, the remainder being about half feldspar and half quartz and waste. Nearly all the spar and quartz in these stockpiles can be easily recovered. The evidence of reserve supply of ore comprises a visible re-expansion of the lens at the southwest extremity of the pit, a fine exposure of spar in the bottom, a 40-ft. shaft sunk in high-grade spar in the bottom of the pit, and large untouched outcrops to the north and south.

For the next six months shipments will be made only from the stockpiles. Meanwhile, the lens of feldspar lying to the southwest of the pit will be opened. A sorting plant is to be erected in the spring. A series of screen analyses and fusion tests is being carried on with a view to establishing grades in conformity with the recommendations of the American Ceramic Society. The company is convinced that standardization in specifications will prove beneficial all around.

News from Washington

By PAUL WOOTON
Special Correspondent

Senate, Independent of House, Will Make Gold-Silver Inquiry

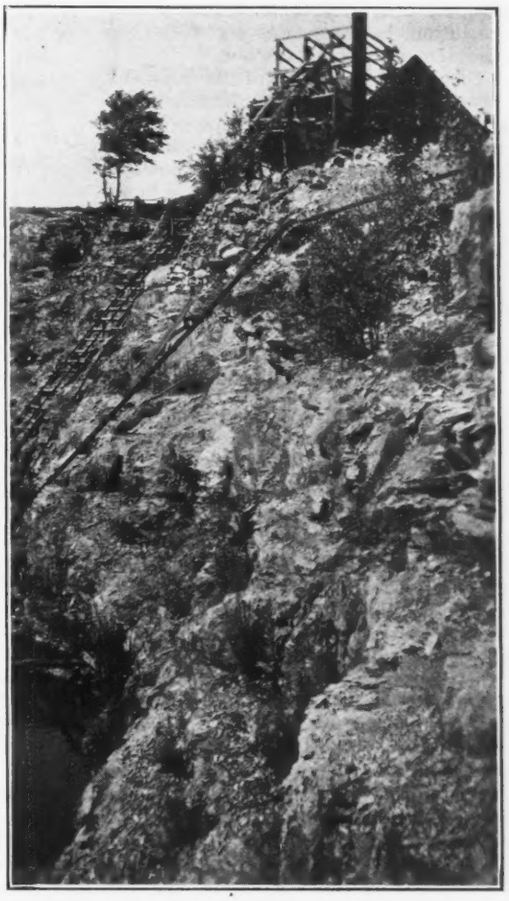
House Would Limit Expenditure—Sensed "Lame-Duck" Junkets—Senate Cuts Loose and Authorizes Own Commission —Plans Still Uncertain

A COMPREHENSIVE investigation is to be made by the Senate Commission of Gold and Silver Inquiry intended to illuminate the uncertain situation of gold and silver under the new conditions which have grown up during and since the World War. The commission was set up under a Senate resolution which was enacted into law during the closing sessions of the late Congress. In pursuance of the authority extended by the act, Vice-president Coolidge designated the following Senators to serve as members of the commission: Samuel D. Nicholson, of Colorado; Tasker L. Oddie, of Nevada; Key Pittman, of Nevada; Thomas J. Walsh, of Montana, and Frank R. Gooding, of Idaho. Each member of the commission represents a mining state, and it happens that all of the members of the commission have had extended practical experience in mining operations.

The resolution originally reported from the Senate Committee on Mines and Mining provided for a joint commission to be composed of representatives of the House as well as of the Senate. This resolution met with unanimous approval on the part of the House Mines and Mining Committee, but on the insistence of House leaders it was amended so as to limit the total amount which the commission could expend to $15,000. Even in that form the resolution met with objection. Representative Blanton, of Texas, opposed the resolution because he said it would provide a Congressional junket. He also expressed the fear that it would be used to provide places for "lame ducks." He even went so far as to intimate that the commission was being proposed so as to provide places for some of its backers, such as Representative Rhodes, of Missouri, and Representative Arentz, of Nevada, who had been defeated for re-election.

When the Senators interested in the inquiry heard of the insistence in the House that the expense to be incurred by the commission was to be so limited as to make a comprehensive investigation impossible, they hurried through a resolution providing for a Senate commission. It is their opinion that a commission on which the House of Representatives would have representation would be more desirable, but as House representation involved what they consider an unreasonable limitation of the expense which may be incurred, they decided the matter could be well investigated by Senate committee, particularly one which would be in a position to expend any amount which might be found necessary for a thorough investigation of the intricate problems involved.

The passage of the resolution authorizing a Senate commission led the



Richardson feldspar quarry in Ontario

House to make a renewed effort to pass the resolution providing for a joint commission. The effort was successful and the resolution providing for a joint commission was passed by a vote of 224 to 17. When the joint resolution was taken up in conference, the Senate conferees refused to accept the limitation on expenditures which the House had imposed. The conference on the joint resolution was not convened until the morning of March 4. No agreement could be reached in conference, and as the session expired on noon of that day, there was no time to take up in the House the matter of receding from the amendment with regard to expense limitation. As a result, the joint resolution died in conference with the expiration of the session. The Senate resolution, however, was signed by the President and became a law.

Though the members of the Gold and Silver Commission have definite ideas as to the character and scope of their inquiry, no formal plan of procedure has as yet been evolved. At least one specialist will be retained by the commission to assist it in its work. The gathering of the information will begin at once and will be pursued actively during the summer.

Iron-Mining Companies Awarded Additional War-Minerals Relief

Robinson Re-figures Claims and Disposes of $144,209 and $47,072 of his Fund—Sundry Other Awards

An award of $144,209.48 to the Oneida Mines Co., of Duluth, Minn., has been recommended by War Minerals Relief Commissioner Robinson. Of that amount $122,676.83 is to cover the net loss on the Sultana mine and $21,532.65 on the Clark mine. In the course of his opinion, Judge Robinson says:

"The former commission conceded stimulation and commercial importance. Losses sustained on the Clark property were allowed. As to the Sultana, where a washer had been installed, the washer expenditures were compensated, but the operating loss was denied. The amount of the award was $192,826.69.

"Respecting the operating loss on the Sultana, it would seem that if the former commission could allow for the loss on the washer, the loss on the operations also should have been considered."

The allowable expenditures on the Sultana mine were found by Commissioner Robinson to have been $172,205.93. From that sum he deducts $49,529.10 for an adjustment of depreciation charge, interest, rents and taxes, president's salary, and receipts from ore. The additional award on the Clark property is to cover an error in stating expenditures, an error in deducting for supplies on hand, and excess salvage on machinery and equipment.

An award of $47,072.70 has been recommended by Commissioner Robinson in the claim of the Northern Minnesota Ore Co., of Deerwood, Minn. In that case the former commission recommended an award of $59,645.12. Commissioner Robinson concedes an earlier date of stimulation and allows the net loss incurred during that period. He makes certain changes in the salvage, but denies the expenditures for financing and purchase of property. The claim made for the salary of the president of the company is reduced to a subsistence allowance.

Subject to the approval of the Secretary of the Interior, the War Minerals Relief Commission has made further awards as follows: M. E. Martin, Red Lodge, Mont., $725; Mills and Crisman, Tehama County, Calif., $1,153.19; James E. Larsen, Burntranch, Calif., $136; Dr. E. I. Krebb, San Francisco, $692; Barnum, Hughes & Co., Etha Mills, Calif., $428.63; Bair and Newmyer, Boulder, Colo., $2,131.14; Wills Brothers Co., Philipsburg, Mont., $1,834; United Tungsten Co., Los Angeles, $6,515.87; E. W. Zibbell, Oroville, Wash., $2,367.79; Thomas A. McGrath, Boulder, Colo., $2,714.50; Edward Wagner, Wheeling, W. Va., $9,342.23; and George and William Pedro, Sonora, Calif., $265.90. In the claim of Radcliffe and Cline, of Denver, Commissioner Robinson holds that the commercial importance of the property has not been established.

News by Mining Districts

By Special Correspondents in the Field

Montreal Letter

Fair Year for Asbestos Industry in Canada—Outlook Encouraging, Says Ross

BY ALEXANDER GRAY

Montreal, March 2—President W. G. Ross of the Asbestos Corporation of Canada is a wary business diplomat who never says more than need be said—and then he prefers to say it in a few words. He is the chief factor in the Quebec asbestos industry—and that industry fully comprehends the world-wide conditions affecting it—in markets and in competition. Quebec may be supreme in the diversity of its asbestos products, more particularly of its "crudes," but too much prosperity has its menaces, and South Africa has indicated its ability to be disconcerting. Therefore, Mr. Ross, having canvassed the whole situation, being aware of what other countries can offer, was qualifiedly optimistic in what he incorporated in the annual report of the Asbestos Corporation, covering 1922 operations and the outlook. Superiority without that almost a monopoly, which brought about domestic conflict, has established a sense of security, yet industrial lines have to be re-formed. Perfected selling organizations and operating efficiencies, have enabled the Asbestos Corporation to make this presentation:

	1922	1921
Profits	$727,093	$756,644
Investment income	152,192	136,414
Net income	$879,285	$893,058
Bond interest	150,000	150,000
Balance	$729,285	$743,058
Depreciation	194,299	199,800
Balance	$534,986	$543,258
Preferred dividends	280,000	280,000
Balance	$254,986	$263,258
Common dividends	180,000	180,000
Surplus	$74,986	$83,258
Previous surplus	2,136,090	2,052,831
Total surplus	$2,211,076	$2,136,089

Current assets, less current liabilities, of $451,875, being in cash, give the Asbestos Corporation liquid working capital of $1,357,948. Investments stand at $2,208,486, as against $2,182,077 the year before. Bonds in amount of $55,000 were taken up. The income from investments increased from $136,414 to $152,192.

The net income being about half of what it was in 1920, and prices for asbestos products having been shaded all around, it is apparent that the increase in the volume of business is welcomed by even the most opulent. Relief from what in effect was an export tax has been helpful. With international exchange nearing equilibrium, exports to Europe are increasing and milling expansion is planned by both the Asbestos Corporation and the Johns-Manville people. Mr. Ross says:

"Renewed building and commercial activities in the United States have been felt in the asbestos industry, and the demand for your company's products has been greater than for the last two years. Offsetting this, however, has been the curtailed shipments to Europe, more especially to Germany.

"The spring of 1922 saw a more active resumption of mining activities in the district, and consequent greater production. Shipments are also heavier, but prices have decreased considerably.

"During the year, the stripping of ground at the Kings pit was continued, over 134,000 cu.yd. having been removed, greatly enlarging this important pit, and placing the company in a position to increase the output when market conditions warrant it. In connection with this property, plans have been carefully studied with a view to the erection of an additional mill of 1,200-ton capacity per shift, which, when fully completed, will nearly double that of the present mill. It is expected, with the experience gained in the past, the process of manufacture will be improved and economies result from the same. . . . At the present time, in order to help out the employment of labor, as well as to anticipate a better demand during the coming year, all mines and mills are running at full day's shift."

U. S. Navy Offers for Sale 5,000,000 Lb. of Copper

Five million pounds of copper ingots, grade 1, 9 to 12 in. long, has been offered for sale by the Navy Department. Bids are to be opened at 11 a.m., March 8, at the Washington Navy Yard.

London Letter

San Francisco Mines in Mexico Solve Metallurgical Problem and Make Money

BY W. A. DOMAN

London, Feb. 22—Since the Union Corporation associated itself with the property of San Francisco Mines of Mexico, a remarkable hange has come over the fortunes of the latter. Burdened at one time with what appeared to be an almost insoluble metallurgical problem, it is now on the high road to prosperity. Knox & Allen, the consulting engineers, say in their report, "it is safe to assert that thus far no signs have appeared to dim the prospect of a long and prosperous career for the enterprise." As the directors' report and accounts cover twelve months to Sept. 30 last, they do not show the full progress made. Nevertheless the document is highly satisfactory.

From the treatment of 34,368 tons of lead residues and 49,207 tons of sulphide ore, and the shipment of 5,744 tons of oxide ore to the smelter, 13,115 tons of lead concentrates were recovered, for a profit at the mine of £58,131, of which £41,940 was earned in the last four months. In the report no revenue accrued from zinc, but as the treatment process for the production of zinc concentrates has been successfully worked out, a contract has been made for the sale to European smelters of the entire production to the end of 1924.

The above noted results were obtained from a plant with a capacity of 250 tons per day. This capacity is now being doubled at an estimated cost of $46,750 (gold), though it is not improbable that provision will be made for further expansion, and a figure of $120,000 is suggested. A new contract with the smelter has improved the terms of sale of the lead concentrates to the extent of $1.25 per ton. In September last the recoveries were 71.07 per cent of the silver and 80.68 per cent of the lead, and better extractions are expected. At Sept. 30 the sulphide ore reserves were estimated at 204,000 tons, assaying 630 gm. silver, 1.6 gm. gold, and 11.5 per cent lead. At the same date the indebtedness was £397,760; it is now £215,302. Profits will soon be freed for distribution as dividend it is believed.

Two West African mining companies which originally were one—the Taquah Mining & Exploration Co. and the Abosso Gold Mining Co.—are to be reunited. The former property is rapidly approaching exhaustion, though the latter is estimated to be workable for several years. The new capital will be £300,000 in 5s. shares, and the name of the company is to be Taquah and Abosso Consolidated. In the Taquah there are developed ore reserves of about 125,000 tons, of an estimated value of 50s. 9d. per ton, and in the Abosso 292,000 tons, of a mill-head value of 34s. 6d. Both companies have suffered from labor shortage, but the position in this respect is now said to be better.

Johannesburg Letter

Lower Working Costs Improve Outlook for the Mines—"Labor" Takes Co-operative Attitude

BY JOHN WATSON

Johannesburg, Jan. 23—Early in the week, the share market was active, with buying orders from London. Geduldss rose from 59s. to 64s. On Tuesday, news of the French occupation of the Ruhr Valley caused a set-back, London sent selling orders, and, on the whole business for the week has been quiet.

With the lower working costs now prevailing, quite a number of gold mines on the Rand can look forward, under present conditions, to a profit-earning period of twenty years or more. This is a much better outlook than was possible under the high costs of a year ago. Mine managers who have recently been interviewed say that a much better feeling now prevails and there is a marked increase of efficiency both underground and on the surface. The mine manager is now in a position to pay wages for work done. In the rebuilding of the workers' unions, since the strike, the average level-headed men are taking a more active interest; the wild men who fomented the strike are now shunted, the majority of workers feeling that they have been misled. A complimentary dinner was given at Messina (Northern Transvaal) on New Year's Eve in honor of J. S. Grenfell, chairman of the Development Co., Ltd., on the eve of his departure for East Africa. The health of the guest of the evening was proposed by the General Manager (A. B. Emery), who referred to the untiring and dogged perseverance of Colonel Grenfell, on behalf of the copper company. In responding the colonel described the vicissitudes through which they had passed for twenty years. On one occasion, they had 200 natives and ran out of mealie-meal, when the "boys" had to be sent out on the veld to catch locusts to keep them going till the wagon arrived from Pietersburg, via the Brak River, a distance of 180 miles. Given normal conditions now, the mine should have a life of seven to ten years, and during that time probably £1,000,000 may be spent in the district on wages and stores. Colonel Grenfell is expected to return to Messina by the end of March.

The annual meeting of the South African Institute of Electrical Engineers was held on Jan. 18. The annual report sounds a note to the effect that the progress of electrical engineering in this country is assured. Last year's president, E. V. Perrow, has gone to Broken Hill. The new president is R. F. Botting, a director of the well-known local firm, Hubert Davies & Co., Ltd. The new president, in his address, reviewed recent developments of electrical engineering in South Africa.

Two valuable diamonds are reported from Jacob's Rush, on the Pniel Estate, Kimberley District. One weighing 71 carats realized £1,000, the other, of 127 carats, being bought in at £1,651.

ONTARIO

Developments in Larder Lake District

Recent developments in the Larder Lake district of northern Ontario add further prominence to this field, and the indications are that new properties will be developed this summer. The latest information is from the property of the Associated Goldfields, adjoining the holdings of the Crown Reserve. Officials state that several hundred feet of drifting has been done on the 250 level and the ore averaged about $8 a ton. The full width of the vein has only recently been proved, and it shows an average of $8 over a width of 33 ft. This confirms the results on the Crown Reserve property on the continuation of the same vein, where the estimated average is $7 over 24 ft. The capital of the Crown Reserve has been increased by $2,000,000, to provide funds for further development and a mill. In the same section the Argonaut mill is practically completed and is expected to start production in May. The mill has a maximum capacity of 200 tons, and $15 ore is anticipated.

BRITISH COLUMBIA

Development Outlined for Fish Creek Mine

G. P. Jackson, formerly manager for the Alaska-Gastineau mine, has spent a week at the Fish Creek mine in the Portland Canal district, and, as a result of his examination, considerable development and new equipment are foreshadowed. A crosscut tunnel is to be driven at a lower level and is to be the main working tunnel from which all ore will be drawn. A tramway is to be built to connect this tunnel with the main road, where ore bunkers will be erected. A site has been purchased for a concentrator, but the erection of the plant probably will be deferred until the development work has been done.

Rossland Mines Will Produce Soon

Resumption of operations in the mines of the Rossland district owned by the Consolidated Mining & Smelting Co. will take place as soon as the large concentrator of the Sullivan mine, at Kimberley, is completed. This should be some time during the coming summer, according to announcements of J. J. Warren, president of the Consolidated Mining & Smelting Co.

The mines at Rossland have been idle for some time, except for some development work carried on in 1922, which cost about $300,000. Formerly the ores were concentrated in the company's plant at Trail, but as soon as the Sullivan mine, at Kimberley, began production the ores from that mine were treated in the Trail concentrator and the mines belonging to the company in Rossland were shut down. The new concentrator now nearing completion at Kimberley will treat 3,000 tons per day and will relieve the concentrator at Trail for treatment of the Rossland ores.

MEXICO

Refugio and Lepanto Mines Will Be Operated

El Refugio y Anexas Mining Co. has been organized at Torreon for the purpose of operating the Refugio and Lepanto mines in the municipality of Rodea, San Juan del Rio mining district, State of Durango. Marcelino Horgado, and J. M. Garza Aldape, well known mining engineer, are the principals in this new organization. Garza Aldape recently visited the mine and obtained about 200 samples and data for a full report.

Both the Refugio and Lepanto properties have been worked from time to time since the early Spanish settlers devoted their attention to the mining of precious metals for exportation to Spain. During recent years American and other foreign companies have inspected them with the hopes of being able to acquire possession, but the owners preferred to retain a controlling interest and former negotiations have failed to materialize. Under the present plans of organization some foreign capital will be invested, together with that supplied by local people.

The mines contain immense quantities of low-grade ore with narrow veins rich in gold. It is planned to erect a concentrating plant for treating the silver ores. The mines are easy of access by good wagon roads to Gabriel station, on the Torreon-Durango branch, and Bermejillo, on the main line, between Juarez and Mexico City. These roads can easily be put in condition for automobile traffic.

Old Properties Will Be Reopened

E. O. Rayan, operating in the Cusihuiriachic region, has recently acquired two additional mines, the Veintitres and Los Pinos. Both are situated on the lands owned by the Carlos Zuluaga estate near the station of Huizochic. Engineer Jose Muñoz Salas is making a resurvey of these properties. New shafts are to be sunk to prove up the veins which carry gold, silver and lead.

IDAHO

Tainton Equipment Being Installed

The Tainton process for the treatment of complex lead-silver-zinc ores, equipment for using which is being installed by the Bunker Hill & Sullivan Co. at Kellogg, Idaho, is expected to be in operation about April 1. The initial plant will have a daily capacity of about fifty tons. The process involves fine grinding of the ore, concentration, roasting, leaching, and electrolytic precipitation. The construction of this plant followed a long series of experiments with various kinds of ores, and the results have been so satisfactory that great confidence is felt that the process in practical operation will not only prove successful, but will revolutionize the treatment of classes of ore to which it is adapted, thereby stimulating mining in the Coeur d'Alene and neighboring region.

CALIFORNIA

Accident Commission Issues New Set of "Fire" Orders

Special San Francisco Correspondence

The Industrial Accident Commission of California has adopted a new series of mine fire-control safety orders, which are made effective March 15, 1923. They are the result of a number of meetings of operators, mining men, engineers, and others. They are severe, and their application to the mining conditions of the state will be an experiment. Provision is made for fire drills, control of mine ventilation by fire doors, fireproofing shaft collars and stations, weekly inspections of mine workings for fire hazards, installation and testing of fire-fighting equipment, posting of charts showing exits and fire-fighting equipment, maintenance of auxiliary telephone and compressed air lines, the use of stench warnings, installation of fire alarms, fireproofing of inflammable material near electrical equipment and regular reports to the commission on mine conditions.

Afterthought Being Unwatered

The Afterthought mine, near Ingot, which has been shut down for several years, is being unwatered. Presumably this is for the purpose of mine examination, as it is understood that the property has been for sale. The mine has available ore of a complex nature. The funds of the company were exhausted in metallurgical experimenting without attaining a successful method of ore treatment.

NEVADA

Betty O'Neal Will Increase Plant

Production of the Betty O'Neal mine, near Battle Mountain, was at the rate of 100 tons per day for the first half of February. Mill heads averaged around $24 per ton, and gross production was $36,000, which is a high record for the company to date. Figures for operations during the latter half of the month are not yet available, but will likely be smaller on account of necessary mill repairs and replacements.

The main haulage tunnel has been extended over 300 ft. beyond the shaft, and is in formation and locality in which the Estella vein is likely to be cut at any time. Mine conditions are said to be good, with ore being developed faster than it is being mined. Orders have been placed for machinery for the second mill unit and foundations are now being laid. It is expected that this second unit will be completed in May.

Goldfield Deep Shaft Will Be Gunited

The shaft of the Goldfield Deep Mines Co. is to be coated with concrete from the 600- to the 1,400-ft. point; a cement gun will be used. Three coats are to be given, and it is hoped by this method to seal off certain portions of the rock in the shaft which show a tendency to crumble when exposed to the air. This is said to be the first extensive application of the cement gun to underground work in Nevada.

Prince Development Continues

With heavy snow cutting off communication with the outside mining districts tributary to Pioche, interest centers in the resumption of work at the Virginia Louise mine and the continuation of development at the Prince property. The directorate of the Prince has been reorganized as follows: B. F. Miller, Jr., president; H. W. Rand, vice-president; M. C. Godbe, secretary and treasurer. The policy of the new management will be to continue the unwatering of the mine and open up as rapidly as possible the orebodies already located by diamond drilling. Mr. Rand, who is heavily interested in the Virginia Louise Development Co., is also interested in the Prince mine, and this intermingling of interests will work for the benefit of both properties. James Quirk, newly appointed superintendent of the Virginia Louise mine, has already begun development work on both the 300 and 500 levels south to determine the extent of the orebodies. A contract with the United States Smelting, Refining & Mining Co. has been arranged, and W. C. Browne, for a number of years in charge of the Prince mine, has recently completed an examination of the mine with a view to the immediate shipment of a daily output of 250 tons.

UTAH

Tintic Shipments Break Record

Ore shipments from the Tintic district for the week ended Feb. 23 were: Chief Consolidated, 68 cars; Tintic Standard, 44; Victoria, 17; Iron Blossom, 17; Eagle & Blue Bell, 16; Dragon, 14; Colorado, 12; Swansea, 6; Iron King, 4; American Star, 2; Centennial-Eureka, 2; Mammoth, 2; Bullion Beck, 1; Little May, 1. In addition to the above, the Chief Consolidated shipped 11 cars of gravel and two cars of limestone. This is the best week on record.

COLORADO

Black Bear Will Supply Ore for Coolbaugh-Process Plant

Announcement has just been made by Bulkeley Wells, president of the Colorado Superior Mining Co., that about March 15, 100 additional miners will be put to work on the Black Bear properties, near Telluride.

For several months a small force of miners have been employed on the property, getting it in condition for capacity production by the time the sulphating plant under construction by the American Smelting & Refining Co. at Durango was completed. It is now expected that the first unit of the plant will be ready for ore by April 15, or not later than May 1.

The ore will be conducted from the mine over a two-mile rope tram to the Pandora mill of the Smuggler Union Mining Co., and treated in a specially designed unit of the mill, employing concentration by tables and flotation. The concentrates will be shipped to the Coolbaugh, or sulphating plant, at Durango. The concentrates will be shipped to Durango as fast as produced,

and stored to be ready for the completion of the plant.

The Black Bear ore is highly refractory, and, because of the difficulty of treating it, the mine closed down about two years ago. Exhaustive tests of the ore with the Coolbaugh process indicate that a satisfactory saving can now be made, and this property will furnish the bulk of the ore for the initial unit, which will treat 40 tons of concentrates daily. The ore carries gold, silver, lead, zinc, and copper.

WASHINGTON

Company Will Exploit Kaolin and Ocher

A new company known as the American Ocher Co. has been organized with headquarters in Spokane. The company owns clay beds situated in Stevens County, 28 miles northwest of Spokane.

It is claimed by this new company that its clay beds contain kaolin, ocher, and sienna, each of which occurs in distinct layers in the bed, which covers about 100 acres. The kaolin is said to be equal to English whiting, which is imported and is being used in this country as paper filler and the manufacture of insulators, porcelain, chinaware, and interior decorating. The sienna can be used in the paint industry and in the manufacture of linoleums, according to M. G. Swanson.

ARIZONA

Tom Reed Starts Stoping of New Ore Shoot

Stoping has been started on the 300 level of the Tom Reed mine, at Oatman, on the new ore that was recently found. The ore is 5 ft. wide and averages $20 per ton. This vein is thought to be the upper segment of the Aztec vein, and, from all indications, it is going to prove as productive as the lower segment, from which over $3,000,000 gold was taken. The drift on the 700 level is continuing on the vein and in ore, but it is not so wide or of such high grade as that on the 500 level. However, it is expected that much of this and other high-grade ores recently encountered will enable the mining of a large amount of lower-grade ores from the old workings, still maintaining a good grade for the mine output.

Swisshelm Company Will Build Mill

The Swisshelm Mining & Development Co., whose property is in the Swisshelm Mountains, 30 miles north of Douglas, Ariz., announces that the construction of a 30-ton mill will be started at once. About 15,000 tons of ore with an assay value of $18 per ton is on the dump in readiness for milling, and large quantities have been blocked out in stoping areas.

Mines Manganese Dioxide

T. B. Atkins, who has been shipping manganese dioxide ore from Aguila for the last ten months, has reached a depth of 60 ft. in his operations. The ore occurs in a 12-ft. vein in limestone. The ore goes to manufacturers on the Pacific Coast.

NEW MEXICO

Manganese Operations Suspended

The Grant County Mining Co., which has been shipping about 300 tons of ferromanganese ores daily from Boston Hill, in Silver City, has suspended operations. There has been a steady demand for the ore, which has been going to the C. F. & I. at Pueblo, Colo. It is reported that Robert I. Kirchman, who opened the Silver Spot mine on this ground several years ago, has interested eastern capital and secured a lease of the adjoining ground from the C. Amory Stevens estate and will operate both properties.

Wyman Silver Mine Leased

The Ed. Wyman silver mine, which adjoins the Volcano mine, about four miles north of Steins Pass, has been leased for a term of six months by Ed. Perault and associates, of Silver City. Work has been started, and three cars of ore sorted from the dump has been shipped to the El Paso smelter. Shipments from this property in the past have averaged about 60 oz. silver. The shaft, which is down 90 ft., will be extended to the 150 level at once.

Two Concentrators Busy in Sierra County

Mining activity is returning to the Black Range country, in Sierra County. The Amethyst mine, near Fluorine, is shipping ore, and the New Republic mill is turning out concentrates which are hauled to Hatch, on the Santa Fe railroad, for shipment to El Paso smelter. The Silver Mountain Metals Co., 10 miles west of Chloride, is operating its concentrator and the Midnight property is also working. The old Ivanhoe, once operated by Colonel Robert G. Ingersol, has been taken under lease and bond, and work will be started March 1.

JOPLIN—MIAMI DISTRICT

Three New Shafts Feed Two Mills

The task of preparing the Anna Beaver properties at Cardin, Okla., for reopening after an idleness of more than a year has proceeded even more rapidly than was expected, and the No. 2 mill was started on Monday, March 5. No. 1 mill will be producing, according to Lee Fillius manager, in about sixty days.

The company has been busy sinking three new shafts, and results are said to be satisfactory to the management. It is expected the three shafts will be amply able to supply enough ore to keep the two mills operating steadily.

V. Rakowsky and Associates Start Sinking

After one of the most thorough drilling compaigns ever carried on in this field, the Kansas Mineral Explorations Co. has started sinking a shaft on its 240-acre lease, situated in Kansas just north of the Webber mine of the Commerce Mining & Royalty Co.

The company has been drilling on the land for more than a year, a part of the time having ten drill rigs operating. Most of the holes were put down to a depth of more than 300 ft. Results were not made public.

The district office of the Exploration company has been removed from Baxter Springs, Kan., to Joplin. Victor Rakowsky and Foster S. Naething, of this city, are the principal owners.

Kitty Mining Co. Resumes

The Kitty Mining Co., which last November abandoned its mine west of Cardin, Okla., has started operating again on a lease between the Jack & Jill and Bob White mines, some distance to the north. In moving and rebuilding the mill, numerous improvements and enlargements were made. Operations at the new property will be carried on at a depth of 260 ft. R. L. Kidner, of Joplin, is manager.

MICHIGAN

Proposed "Tonnage" Tax Opposed by Copper Mining Companies

By M. W. Youngs

The tonnage tax issue has been revived in the Michigan Legislature. A bill has been introduced proposing to raise $26,000,000 annually on the state's output of mineral and forest products. The measure is more sweeping than any tonnage tax levy previously proposed. Previous bills have attempted to tax only copper, iron ore, and salt. The new measure covers almost every known mineral and forest product. On copper it would levy at the rate of $11.20 annually per long ton, more than half a cent per lb. For iron ore a sliding rate of from 5c. to 30c. a ton is provided, depending on the quality of the ore.

The proposed tax on copper would be a hard blow to the copper-mining industry in Michigan, in the opinion of Lake Superior mining men. Even under the most favorable conditions, the Michigan mines must employ the utmost efficiency and engineering skill to compete successfully with the great low-cost producers of the southwest, it is held, and a tax of better than ½c. per lb. would be a serious handicap.

It also is pointed out that the copper mines already are heavily taxed both by the state and federal governments, and to make them pay a specific tax on their product would amount to double taxation and discrimination. Taxation in the majority of cases in industry is passed on to the consumer, but it contended this could not be done if Michigan metal were specifically taxed, as Michigan copper would have to enter the market on the same basis as metal produced in other states which was not directly taxed.

The proposed tax also comes at a time when many of the mines are just emerging from a long period of depression and financial losses. Copper has been mined at a loss during the greater part of the last four years by some Michigan companies, which have continued partial operations merely to maintain the physical condition of their properties, and other mines have been entirely shut down.

The Situation at the Mines

By Arthur B. Parsons
Assistant Editor

FOR THE FIRST TIME in nearly three years it can be said unreservedly that current copper production is subject to no artificial restriction. Maximum output is the aim of every important producer, although the inability to get miners to do the digging prevents realization from equaling desire in some places. To say that the sensational jump in the copper market from 14.75c. to 16.50c. in the one short month of February is the cause of stimulated activity is hardly accurate. The spurt in the market is rather a symptom of the underlying conditions that have warranted the gradual increase in production during recent months. Nevertheless, it is a welcome symptom, and it has increased the confidence of producers in their diagnosis of the situation. As a consequence, apparently, the Phelps Dodge company has just decided to push ahead the starting of its new 4,000-ton concentrator at Bisbee, and the first unit of 1,000 tons will start on April 1 instead of on May 1, as scheduled some months ago.

Inspiration, with sixteen sections of its mill at Miami in operation, is producing more than it has at any time since the shutdown in 1921. At Butte, that well-known producer of zinc-silver ore, the Butte & Superior company, has become a copper producer for the first time in history, and during March will ship ore to smelt 400,000 lb. of copper in addition to its regular zinc shipments.

The following table indicates the approximate rate of current output of the principal American copper producers at this writing:

Estimated Current Rate of Copper Production in Pounds per Month

Ahmeek	1,700,000	Kennecott	5,000,000
Anaconda	17,000,000	Miami	6,000,000
Arizona Commercial	800,000	Moctezuma (P. D.)	3,000,000
Braden	10,000,000	Mohawk	850,000
Butte & Superior	400,000	Mother Lode Coalition	2,000,000
Calumet & Arizona	4,000,000	Nevada Consolidated	4,000,000
Calumet & Hecla	4,800,000	New Cornelia	3,500,000
Cerro de Pasco	6,000,000	North Butte	1,500,000
Chili	17,000,000	Old Dominion	2,100,000
Chino	5,000,000	Phelps Dodge (U. S.)	8,000,000
Copper Range	2,000,000	Quincy	900,000
Davis Daly	900,000	Ray	5,000,000
East Butte	400,000	United Verde	8,000,000
Engels	1,300,000	United Verde Ex.	3,500,000
Granby Consolidated	3,500,000	Utah Consolidated	1,000,000
Greene Cananea	3,300,000	Utah Copper	15,000,000
Inspiration	9,000,000		

There is no slackening, of course, in the production of zinc, lead, silver, and gold, so that the labor problem in practically every district in the United States is assuming an increasingly serious aspect. The prevailing opinion is that spring will make matters worse, especially in view of the effort that will be made to further accelerate the rate of copper production. What will be done in the way of increasing wages remains to be seen, but two increases have been made during the last month. In Southeastern Missouri a 10 per cent raise, the third in the last six months, has been put into effect, and in Michigan the Quincy Mining Co. has announced an increase that will amount to about 35c. per day. In Arizona the complaint is made that experienced machine men are hard to get; the Coeur d'Alene operators, in Idaho, are worrying about the immediate future; and in the Randsburg silver district, in southern California, where the standard wage scale is $6, miners are hard to get, even with the payment of a bonus averaging $1 per shift. With monotonous regularity we must reaffirm the statement that the labor shortage is the most embarrassing problem that confronts the mining industry.

In California the Engels Copper Co. is producing more than ever before; several stamp mills have been started on gold ore at Grass Valley and sundry Mother Lode camps; and the California Rand continues the flow of silver ore and concentrate to Selby smelter.

In Nevada, Tonopah production of silver ore is normal. The Betty O'Neal company is doubling the capacity of its 100-ton mill near Battle Mountain. Nevada Consolidated is increasing its copper output as rapidly as equipment can be installed in the rebuilt concentrator.

The operation of the smelters in Salt Lake Valley is a good index to activity not only in Utah but in surrounding states. The A. S. & R. company added two lead furnaces and the U. S. company one furnace to the five that each had in blast a month ago. In spite of the short month, shipments from both Park City and Bingham increased. The new Keystone mill, at Park City, produced 450 tons of high-grade lead concentrate. The Utah-Apex company will increase its mill capacity at Bingham to 400 tons.

Fires in the Morning and Hercules mines and extremely cold weather in the Coeur d'Alene district of Idaho interfered with production during February, but operations are again normal.

Butte is doing well, despite labor shortage in Montana, and Anaconda has reached much the highest production rate since active operations were resumed in January, 1922. The American Zinc, Lead & Smelting Co. started its Silver Plume mill at Neihart. The operation of this 400-ton plant is the first attempt to exploit low-grade ore in this productive old district.

Production at the Shattuck & Arizona mine, in the Bisbee district of Arizona, was resumed in February. Finishing touches are being rushed at the 4,000-ton Copper Queen mill, in the same district, to start on steam-shovel ore from Sacramento Hill—this ore being particularly desirable because underground men are not needed to mine it. Arizonans predict that every mine in the state will be operating at its maximum in a month or two.

The Colorado Superior company is engaging 100 miners to start regular stoping in the Black Bear mine, in San Miguel County, Colo. This is notable because the complex concentrate from the ore is to go to the new plant at Durango for the initial operation of the Coolbaugh process. The Wolf Tongue Mining Co. will re-start its custom tungsten concentrator near Boulder, thereby permitting a dozen small producers to resume. Despite the short month, February shipments of lead ore to Durango exceeded those of January.

In South Dakota, the Trojan company suspended operation pending further development. At the same time the Gold Feather mill was started. The Homestake is grinding away as usual.

The situation in Michigan is reflected by the copper production figures in the accompanying table. Production would be higher if more men were available. It is predicted that the Osceola, Allouez, and Centennial mines of the Calumet & Hecla group will be opened if, and when, miners can be obtained.

Most optimistic reports come from the Joplin-Miami district. More mills than ever are grinding "dirt," and 13,500 tons of concentrate is being produced weekly. Moreover, the labor supply is adequate. However, Missouri miners are also farmers, and the plowing season is near, so look out!

In Ontario the annual shortage of electric power is at hand, and is unusually serious. Porcupine mills are running at half capacity. Exceedingly rich silver ore has been found in the Keeley mine, in South Lorrain. Development work in the various districts is unusually active—incidentally, in synchronism with operations on stock exchanges on both sides of the Atlantic.

The starting of the new Britannia concentrator, with a capacity of 2,500 tons of copper ore, on Howe Sound, will add to British Columbia's copper output. Notable events of the last month are the acquisition by the Granby Consolidated company of the Copper Mountain property and the decision of the Consolidated M. & S. Co. to reopen the Rossland mines on a large scale as soon as the new mill at Kimberley is finished. It is reported authoritatively that the rich silver-gold orebodjes of the Premier mine, in the Portland Canal district, have been found below the 400 level, thereby encouraging development in the vicinity.

THE MARKET REPORT

Daily Prices of Metals

Mar.	Copper, N. Y. net refinery*	Tin		Lead		Zinc
	Electrolytic	99 Per Cent	Straits	N. Y.	St. L.	St. L.
1	16.50 @16.75	45.00@45.50	46.875	8.15	8.25	7.60 @7.75
2	16.625@16.75	44.25@44.75	46.25	8.25@8.40	8.25@8.40	7.65 @7.80
3	16.75	44.375@44.75	46.375	8.25@8.40	8.25@8.40	7.65 @7.80
5	16.75	44.875@45.25	46.75	8.25	8.30@8.40	7.625@7.80
6	16.625@16.75	44.875@45.50	46.75@47.25	8.25	8.30@8.40	7.60 @7.80
7	16.50 @16.75	45.00@45.25	46.75@47.25	8.25	8.30@8.40	7.50 @7.75

*These prices correspond to the following quotations for copper delivered: March 1st, 16.75@17c.; 2d, 16.875@17c.; 3d and 5th, 17c.; 6th, 16.875@17c.; 7th, 16.75@17c.

The above quotations are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for deliveries constituting the major markets, reduced to the basis of New York cash, except where St. Louis is the normal basing point, or as otherwise noted. All prices are in cents per pound. Copper is commonly sold "delivered," which means that the seller pays the freight from the refinery to the buyer's destination.

Quotations for copper are for ordinary forms of wire bars, ingot bars and cakes. For ingots an extra of 0.05c. per lb. is charged and there are other extras for other shapes. Cathodes are sold at a discount of 0.125c. per lb.

Quotations for zinc are for ordinary Prime Western brands. Tin quotations are for prompt deliveries. Quotations for lead reflect prices obtained for common lead, and do not include grades on which a premium is asked.

The quotations are arrived at by a committee consisting of the market editors of *Engineering and Mining Journal-Press* and a special representative of the Bureau of Mines and the Bureau of Foreign and Domestic Commerce.

London

March	Copper			Tin		Lead		Zinc	
	Standard		Electrolytic						
	Spot	3M		Spot	3M	Spot	3M	Spot	3M
1	73 3/8	74	80 1/2	211 1/2	212	29 1/8	28 5/8	37 1/2	37 1/8
2	73 3/4	74 3/8	80 1/2	208 1/2	210	29 1/4	28 3/4	37	37 1/2
5	73 1/4	73 3/4	81	208 7/8	210 1/4	29 3/8	29	36 7/8	37 1/4
6	72 5/8	73 3/8	80	211 3/4	212 3/4	29 5/8	29 1/4	36 5/8	37
7	71 1/8	72 1/8	79 1/2	212 1/2	213 1/2	29 5/8	29	36 5/8	37

The above table gives the closing quotations on the London Metal Exchange. All prices in pounds sterling per ton of 2,240 lb.

Silver and Sterling Exchange

Mar.	Sterling Exchange "Checks"	Silver			Mar.	Sterling Exchange "Checks"	Silver		
		New York Domestic Origin	New York Foreign Origin	London			New York Domestic Origin	New York Foreign Origin	London
1	4.70 1/8	...	66 5/8	31 15/16	5	4.70	99 5/8	67	32 1/8
2	4.70 1/8	99 5/8	66	31 9/16	6	4 69 1/4	99 5/8	67 1/4	32 1/4
3	4.70 1/8	99 5/8	66 1/8	31 11/16	7	4.69 1/4	99 5/8	67	32

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London quotations are in pence per troy ounce of sterling silver, 925 fine. Sterling quotations represent the demand market in the forenoon. Cables command one-quarter of a cent premium.

Metal Markets

New York, March 7, 1923

The week has been a little more quiet in the metal markets than the two or three previous ones have been. Prices in the last day or two have shown a tendency to sag slightly in the case of copper and zinc, but lead continues strong. Silver of foreign origin reached a new high for the year during the week, the recent buying being very encouraging. Railroad embargoes are still troublesome, practically all transportation east of Buffalo being affected. There is not only a shortage of cars but locomotives also are not available, the strike of the railway shopmen still being in effect on several roads.

Copper

Buying has not been so active this week, consumers evidently feeling that a reaction in price was about due after the rapid advance. Speculative holders of copper in London were quick to sense the slight dullness and put metal on the market which caused the price to fall £1 yesterday and 10s. further today. New York dealers who keep in close touch with international affairs reflected this weakness in London quotations and copper was available today in good quantity at 16.75c. delivered for any month in the year. Practically all producers however are adhering to the 17c. price established earlier in the week as they are well sold up for March and April production and have no reason for cutting prices to get rid of their copper.

Export demand has been sporadic during the week, the total being not quite so large as in previous weeks. Today's orders, however, were good and included at least two countries which were hardly expected to be in the market. The prices realized are somewhat better than for domestic business.

Lead

The official contract price of the American Smelting & Refining Co. was advanced from 8.10 to 8.15c. on Thursday, March 1, and to 8.25c. on Friday, March 2.

The lead market continues very firm though there is possibly less disposition to pay premium prices than there was earlier in the week. On Friday and Saturday some lead for forward delivery, extending into June and July, was sold at 8.40c., and last week some lots of Spanish lead, which is of corroding grade, were reported sold as high as 8.50c. Probably several thousand tons of this Spanish lead have been booked for delivery in this country. In the last two or three days, the high prices that have been published, in fact as high as 8.75c., seem to be almost entirely nominal for no sales of any consequence are reported at any such figures. Lead for both March and April shipment is available at the 8.25c. level, though for delivery farther forward higher prices are asked.

The St. Louis market again rules somewhat above that at New York. Quotations generally made are 8.40@8.50c., but consumers do not seem at all disposed to pay such prices and the actual sales have been nearer 8.30c. An occasional sale has been made at higher levels, 8.50c. being an outside price for prompt delivery.

Zinc

After rising steadily during the early part of last week the market has become slightly weaker. Consumers have evidently become satisfied for the time being with the metal recently purchased and are withdrawing support from the market. The decline in London has also had a sympathetic effect. An unusually large discount is being given for purchases of forward zinc. It amounts to ten points per month of future delivery under the prompt quotation. This may have acted as an inducement to consumers as the major part of the week's business was in forward deliveries. The price of high-grade metal remains at 8.50c. per lb.

Tin

Tin has continued in good demand, platers being actively in the market. The price of 99 per cent grade shows an unusual discount from that of Straits owing to English offerings.

Arrivals of tin, in long tons: Total for February, 4,885; March 1, Straits, 765; China, 150; 2d, Liverpool, 135; London, 25; Straits, 75; 5th, Straits, 975; China, 75; London, 100; 6th, Liverpool, 275. Total so far in March, 2,575.

Gold

Gold in London: March 1, 87s. 9d.; 2d, 87s. 9d.; 5th, 87s. 10d.; 6th, 88s.; 7th, 88s. 2d.

Foreign Exchange

Exchanges have been dull. On Tuesday, Mar. 6, cable quotations on francs were 6.085c.; lire, 4.7825c.; marks, 0.0044⅞c.; and Canadian dollars, 1.75 per cent discount.

Silver

Buying orders from both the Indian Bazaars and China, coming at a time when offerings were rather limited, caused a further advance in the price in London and New York. The New York quotation of 67¼c. on March 6 established a new high level for the year. A slight reaction occurred on March 7, caused by re-sales from China, and the market closes quiet.

Mexican Dollars—March 1, 50⅞; 2d, 50⅜; 3d, 50½; 5th, 51⅛; 6th, 51⅜; 7th, 51⅛.

Other Metals

Quotations cover large wholesale lots unless otherwise specified.

Aluminum—General market for 99 per cent grade, 25½@26c. per lb.; 98 per cent, 24½@25c. London quotations, £90@£100.

Antimony — Chinese and Japanese brands 8¾c. W. C. C., 9c.. Cookson's "C" grade, spot 9@9½c. Chinese needle antimony, lump, nominal, 6c. per lb. Standard powdered needle antimony (200) mesh, at 6½c. per lb. White antimony oxide, Chinese, guaranteed 99 per cent Sb_2O_3, 8c.

Bismuth—$2.55 per lb. London quotes 10s.

Cadmium—$1.15 per lb. London quotes 4s. 6d. @ 5s. 6d.

Iridium—$260@$275 per oz.

Nickel—25@30c. per lb. for 99 per cent virgin metal.

Monel Metal—Shot and blocks, 32c. per lb.; ingots, 38c.; f.o.b. W. Va.

Osmium—$80@$85 per oz., Los Angeles.

Palladium—$79 per oz.

Platinum—$110 per oz.

Quicksilver — $69@$70 per 75-lb. flask. San Francisco wires $68.35. London £10 10s.

Ruthenium—$40@$45 per oz.

Selenium—$2 per lb.

The prices of **Cobalt, Molybdenum, Radium, Rhodium, Tellurium** and **Thallium** are unchanged from prices given March 3.

Metallic Ores

Chrome Ore—Indian chrome ore, $20.50 per ton, c.i.f. Atlantic ports. Rhodesian and New Caledonian, $24@$26 per ton.

Manganese Ore—33c. per long ton unit, seaport, plus duty. Chemical ore, $75@$80 per gross ton.

Molybdenum Ore—65@70c. per lb. of MoS_2 for 85 per cent MoS_2 concentrates.

Tungsten Ore—Wolframite, $7.75@$8; scheelite, $8.50@$9 per unit of WO_3, f.o.b. New York.

Iron Ore, Magnetite, Tantalum, Titanium, Uranium, Vanadium, and **Zircon Ore** are unchanged from the quotations published March 3.

Zinc and Lead Ore Markets

Joplin, Mo., March 3—Zinc blende, per ton, high, $49.25; basis 60 per cent zinc, premium, $49; Prime Western, $48; fines and slimes, $47@$45; average settling price, all blende ore, $46. Calamine, basis 40 per cent zinc, $28; average settling price, $29.35 per ton.

Lead, high, $117.90; basis 80 per cent lead, $117.50; average settling price, all lead ore, $109.77 per ton.

Shipments for the week: Blende, 20,074; calamine, 193; lead, 2,064 tons. Value, all ores the week, $1,155,770.

Purchases for the week totaled 19,410 tons of zinc ore at the advanced prices. The heavy shipment recorded was occasioned by the concerted effort to clean up all ore bins in Kansas before the first day of March, when assessment is made in that state for tax levy. A nominal stock was left in Kansas. The further advance of lead to $117.50 brought a small reserve stock onto the market. Demand for both lead and zinc presents a gratifying strength.

Platteville, Wis., March 3—Blende, basis 60 per cent zinc, $52 per ton. Lead, basis 80 per cent lead, $117 per ton. Shipments for the week: Blende, 810 tons; lead, none. Shipments for the year: Blende, 6,719; lead 145 tons. Shipments for the week to separating plants: 398 tons blende.

Non-Metallic Minerals

Asbestos—Crude No. 1, $500; No. 2, $250@$325; long spinning fibers, $135@$200; magnesia and compressed sheet fiber, $100@$150; shingle stock $65@$85; paper stock, $35@42; cement stock, $20@$25; shorts, $9@$14—all per short ton, f.o.b. mines, Quebec, Canada.

Rhodesian No. 1 crude, $375; No. 2, $250; inferior grade, $200—all c.i.f. Atlantic ports per short ton.

Scarcity of cars; embargoes interfering with shipments. Increased strength in grades used in building trades.

Magnesite — Dead-burned magnesite grains, $40 per net ton, f.o.b. Baltimore; $40@$42, Chester, Pa.

Crude, $14 per ton; 85 to 90 per cent MgO calcined lump, $32.50@$38 per ton; calcined ground, in paper sacks, 90 per cent through 200 mesh, $44@$48 per ton—all f.o.b. California points.

Grecian caustic-calcined and ground, $51@$52 per ton, f.o.b. cars, Atlantic seaboard.

Bauxite, Barytes, Chalk, China Clay, Diatomaceous Earth, Emery, Fluorspar, Fuller's Earth, Graphite, Gypsum, Limestone, Manjak, Mica, Monazite, Phosphate, Pumice, Pyrites, Silica, Sulphur, and **Tripoli** are unchanged from the March 3 prices.

Mineral Products

Arsenious Oxide (white arsenic)—14@15c. per lb.

Sodium Sulphate—$26@$28 per ton.

Potassium Sulphate, Sodium Nitrate, and **Copper Sulphate** are unchanged from quotations of March 3.

Ferro-Alloys

Ferromanganese — Domestic, 78@80 per cent, $102.50@$107.50 per gross ton, f.o.b. furnace. Spiegeleisen, 19@21 per cent, $37, f.o.b. furnace; 16@19 per cent, $36.

Ferrosilicon—50 per cent $86@$89 per gross ton, delivered.

Ferrocerium. Ferrochrome. Ferromolybdenum, Ferrotitanium, Ferrotungsten, Ferro-uranium, and **Ferrovanadium** are unchanged from the prices published March 3.

Metal Products

Copper Sheets—Base price, 24¾c. per lb. Wire, 19⅛c.

Nickel Silver—30¼c. per lb., for 18 per cent nickel Grade "A" sheets.

Yellow Metal — Dimension sheets, 22⅛c. per lb.; rods, 19⅛c. per lb.

Zinc Sheets—Base price, $9.65 per 100 lb., East St. Louis.

Lead Sheets—Full, $10.25; cut, $10.50 per 100 lb.

Refractories

Bauxite Brick, Chrome Brick, Chrome Cement, Magnesite Brick, Magnesite Cement, Silica Brick and **Zirkite** are unchanged from the March 3 prices.

The Iron Trade

Pittsburgh, March 6, 1923

There were more or less continuous advances in steel prices up to a week ago, but no important advance has occurred in the last week. Doubt is entertained in many quarters whether extreme activity will continue throughout the year, but heavy consumption is assured well into the second half. Production of steel ingots in February was probably at fully 45,000,000 tons a year, and a higher rate is expected for this month.

Pig Iron—The recent advance of $1 in basic and foundry, to $27 and $28 respectively, at Valley furnaces, is easily maintained, and bessemer has advanced 50c. in the week to $28.50, Valley. Much consumption is already under cover for the second quarter. Though the market is strengthening, it may not advance much more.

Connellsville Coke — Fully 250,000 tons a month has been sold for second quarter on this movement, chiefly at $7, with a few of the latest contracts at $7.25, and much more consumption is still to be covered.

Facts for the Stockholder

VIII—Inspiration Consolidated Copper Co.

THE Inspiration Consolidated Copper Co. was incorporated in Maine, December, 1911, and acquired properties of the Inspiration Copper Co. and the Live Oak Development Co. It is engaged in mining, milling, and smelting operations, and under its broad charter may engage in a variety of industrial enterprises. In 1914, it acquired the property of the New Keystone Copper Co., for which it paid 39,797 shares of its stock. In 1920, it purchased the Montgomery properties from the Warrior Copper Co. for $400,000. This group of sixteen lode claims covers 232 acres, adjoining Inspiration ground on the north. In 1921, it acquired thirty-three claims, and fractions, aggregating 561 acres, from the Porphyry Copper Co. and the Porphyry Consolidated Copper Co., also adjacent to Inspiration ground. The purchased price of this property was $1,000,000.

The company's properties include 1,870 acres of mineral land and 2,346 acres of ground for mill site, tailing disposal, and water-supply purposes, a total of 4,216 acres, situated in the Globe mining district, about 10 miles west of Globe, Ariz. The ore zone is 50 to 500 ft. thick, covered by 100 ft. of overburden, and underlaid by a primary zone of cupriferous pyrite. Payable ore occurs mainly in secondary form as disseminated chalcocite.

Ore reserves are estimated at over 70,000,000 tons, carrying over 15 lb. of copper a ton, developed by over 65 miles of accessible underground workings, representing a life of fifteen years or more for the property.

The property is equipped with a mining plant capable of handling 20,000 tons of ore daily, and the milling plant has a rated capacity of 18,000 tons of ore per day. The mine and mill are connected with both the U. S. Reclamation hydro-electric plant and with the company's steam plant, equipped with three 6,000 kw. turbo-generators.

The company owns a one-half interest in the Arizona Oil Co., the other half being owned by the Anaconda Copper Mining Co. The oil company owns and operates 160 acres of oil-producing land in the Bakersfield district of California. This protects Inspiration's fuel-oil supply, upon which its normal operations depend.

Inspiration is also interested, with other large mining companies of the southwest, in the Apache Powder Co., which manufactures powder in the vicinity of Benson, Ariz. The capacity of this plant has been increased from 12,000,000 to 18,000,000 lb. per year.

Capital stock consists of 1,181,967 shares, $20 par value, of which Anaconda Copper Mining Co. owns 297,300 shares. The number of stockholders in October, 1921, was 14,200, compared with 4,500 in October, 1916. There is no funded debt.

Production was at a maximum in the first half of 1917, when the monthly output was over 11,000,000 lb. In 1919 and 1920, the average production was about 6,000,000 lb. per month. The mine was shut down in March, 1921, and resumed operations in February, 1922. Production is now at the rate of 9,000,000 lb. per month.

Net earnings were over $20,000,000 in 1916, but fell off rapidly in subsequent years, running into a large deficit in 1921 and the early part of 1922. With copper selling at 16c. a pound, it is estimated that the company can earn over $500,000 a month, or at the rate of over $5 a share per annum.

The dividend record is as follows: $5.25 a share in 1916, $8.25 in 1917, $8 in 1918, $6.50 in 1919, $5 in 1920. The last quarterly payment of $1 a share was made Oct. 25, 1920. The recent declaration of a dividend of 50c. a share reflected the improvement in the company's affairs.

Assets applicable to capital stock are estimated at about $25 a share. Current assets are about $7,000,000, compared to current liabilities of $1,000,000, leaving $6,000,000 net working capital.

Price range of the stock has been: High, 74⅜ in 1916; low, 14¼ in 1914; closing price March 6, 1923, 42½.

INVESTIGATOR.

German Metal Industries Greatly Disturbed

SPECIAL FOREIGN CORRESPONDENCE

THE volume of business in the copper trade has experienced a fresh setback, caused largely by the dislocation of traffic through the cutting off of the most important industrial district of Germany from the rest of the country. A number of large rolling mills and manufacturing plants are situated in the endangered quarter, which now, albeit well supplied with fuel, are, however, lacking facilities for bringing in metallic rawstuff or of dispatching half-finished material across the confines into the non-occupied areas. The delicate machinery of the powerful metal industries of Germany is, for the moment, once again out of gear, and consequently the managements are compelled to seek after fresh ingenious readjustments to the new situation.

Copper prices here are below the world quotation; that is, the New York level. The amounts of copper offered by dealers are by far too large. Some fresh lots of metal afloat from the United States or those within bonded warehouses at Hamburg or in British ports have been transferred to foreign contractors, especially antimonial lead, of which upward of 1,000 tons has been resold to American purchasers. The reasons underlying these happenings are both general political uncertainties and the relative abundance of metals, leading to unwillingness to hold the latter any longer than the situation warrants. Besides, the pressing offers of small metal merchants here, who are well organized, especially of scrap dealers, narrow the scope of business for foreign sellers. German business men have not yet accustomed themselves to calculating profit margins in terms of foreign exchanges. When the general price level for metals doubles, as it has, in the course of a week, short-sighted small holders pick up some profits believed to be large, but they may incur heavy losses when the yield is reduced to the dollar value.

The uncertainties of money values is not alone the disturbing factor on the Berlin Metal Exchange. Just now the metal brokers have entered into a strike and decline to trade metals between sellers and buyers at the rates which have been valid down to the end of January of the current year— namely, ⅛ per cent for bullion contracts, ¼ for old metals, ⅜ for virgin metals, and ½ for copper. While the brokers contend that these fees are by no means adequate, in view of the debased money value, dealers, on the other hand, are emphasizing that not only brokers are forbidden to contract on their own accounts and simply to act as intermediaries between interested parties, but that the actual charges are increasing in sympathy with the rising amounts of the bill, which, in their turn, are occasioned by the slump in the value of the mark. This is compensated by the increased face value of the marks received in payment.

Hitherto no agreement has come about between the contending parties and business is carried on without the brokers' intervention. This is a somewhat unwelcome situation for the metal trade in general here, as the uncertainties of price regulations are greatly augmented through the lack of compensating factors. For the underlying character of the Berlin Metal Exchange differs fundamentally from the London or New York institutions, in that on the London exchange the dealers' influence is the commanding feature, while on that of New York the power of the dealers is greatly reduced by the metal producers of America. The separation of ore-mining districts has been followed by the strenthening of controlling power of those who import, handle, and arbitrate metallic stuffs. Therefore, manufacturers seek to ascertain real market prices only by the help of brokers. Consequently it may be expected that the differences will be settled ere long.

Belgian buying of shares of the Aktiengesellschaft für Belgien und Zinkindustrie (i.e., the largest zinc producing company in Germany) has been a feature lately. This occurrence may tend to the later establishment of some control of Belgian interests over the German zinc production.

COMPANY REPORTS

St. Joseph Lead Co.

Lead, Missouri

A report of the operations of the St. Joseph Lead Co. for 1922 states that there was an earned surplus of $3,994,325.09 after all charges for depreciation, depletion, and reserve for federal taxes resulting from the operation for the fiscal year. The mines produced 2,437,459 tons of ore, the mills 146,431 tons of concentrates, and the smelter 105,028 of pig lead. The sales of pig lead for the year amounted to 121,655 tons. (This does not include sales of lead purchased from the Bunker Hill & Sullivan Mining & Concentrating Co.)

Consolidated general balance sheet as of Dec. 31, 1922 follows:

ASSETS

Capital assets		
Ore reserves and mineral rights		$12,460,578.94
Buildings and equipment at mines and smelter		6,722,548.15
Real estate		95,749.78
Farm lands, buildings and equipment	$541,815.14	
Railroad property and equipment	3,678,791.20	23,499,483.21
Investment—Missouri—Illinois Railroad Co.		362,172.99
Sinking fund and reserve fund assets—cash and accrued interest		23,944.01
Current assets		
Cash	$1,257,978.83	
Marketable securities	5,162,770.40	
Accounts and notes receivable	1,664,364.31	
Lead on hand and in process	390,867.59	
Materials and supplies	1,448,616.03	
Store accounts (net)	45,036.87	9,969,634.03
Deferred debit items		329,017.56
Total		$34,184,251.80

LIABILITIES

Capital stock			
St. Joseph Lead Co.			
Authorized 2,000,000 shares of $10 each, of which there have been issued 1,605,744.6 shares		$16,057,446.00	
Less held in treasury, 56,332 shares		563,320.00	$15,494,126.00
Subsidiary companies, minority stock held by public			236,150.00
Funded debt			
Mississippi River & Bonne Terre first mortgage 5 per cent bonds		$2,500,000.00	
Less			
Held in sinking fund	$612,000.00		
Held in treasury	528,000.00	1,140,000.00	1,360,000.00
Current liabilities			
Accounts and wages payable		$1,047,744.90	
Traffic and car service balances		74,254.05	
Dividend declared Dec. 11, 1922, payable March 20, 1923		774,687.50	
Accrued taxes		53,605.90	
Accrued interest		31,328.13	1,981,620.48
Deferred credit items			129,562.78
Reserves			1,352,193.92
Surplus			
Balance, March 1, 1913		$3,925,000.00	
Less amortization distributions therefrom		3,523,665.00	
Remainder		$401,335.00	
Undistributed profits and increase due to revaluation of properties, March 1, 1913, to Dec. 31, 1921		$12,016,832.28	
Balance, Jan. 1, 1922		$12,418,167.28	
Net income for the year ended Dec. 31, 1922, less depreciation	$5,972,333.33		
Less			
Provision for depletion	$1,378,394.49		
Provision for federal taxes	500,000.00		
Miscellaneous charges	99,613.75	1,978,008.24	
Profit and loss surplus for the year ended Dec. 31, 1922		3,994,325.09	
Total		$16,412,492.37	
Less			
Dividends declared and paid in 1922	$2,007,206.25		
Dividend declared Dec. 11, 1922, payable March 20, 1923	774,687.50	2,781,893.75	$13,630,598.62
Total			$34,184,251.80

Montana Bingham Consolidated Mining Co.

Copper, Lead; Utah

A report of the operations of the Montana-Bingham Consolidated Mining Co., for 1922 shows a deficit of $63,437 compared with a deficit of $50,805 for the previous year. Income and profit-and-loss account follows:

Ore sales, less deductions		$105,422.76
Operating expenses, including depreciation	$68,263.36	
General and administrative expenses	14,308.50	82,571.86
Profit from operations		$22,850.90
Other income credits, royalties, rent and interest		603.10
Gross income		$23,454.00
Income charges, including depletion		62,128.75
Net loss for the year before deducting prospecting and development expense		38,674.75
Prospecting and development expense charged off		24,762.47
Net loss for the year		$63,437.22

Balance sheet as of Dec. 31, 1922, is given as follows:

ASSETS

Property		$3,407,841.91
Current assets		31,332.96
Capital stock—United Bingham Copper Co. (book value)		54,300.00
Deferred debit items		2,710.99
Total		$3,496,185.86

LIABILITIES

Common capital stock outstanding			$2,539,996.00
First mortgage 6 per cent gold bonds outstanding			178,600.00
Current liabilities			11,851.50
Reserves			
Depreciation	$9,006.82		
Depletion	58,623.58		
Doubtful accounts receivable	500.00		68,130.40
Surplus			
From assessments paid by stockholders in excess of deficit to Dec. 31, 1921	$97,815.83		
From appreciation of physical property	661,675.00		
Total	$759,490.83		
Add surplus adjustments (net)	1,554.35		
	$761,045.18		
Less net loss for the year ended Dec. 31, 1922	63,437.22		697,607.96
Total			$3,496,185.86

Production amounted to 1,088,711 lb. of copper, 1,027.3 oz. of gold, 33,014 oz. of silver and 44,932 lb. of lead.

Benguet Consolidated Mining Co.

Gold; Philippine Islands

The property holdings of the Benguet Consolidated Mining Co., Benguet Province, P. I., comprise seventeen patented and twenty-one unpatented claims. A three-compartment shaft is now down to a depth of 108 ft. below level D. Sinking was resumed in October, 1922, the plan being to continue the shaft, before crosscutting, to a point 222 ft. lower, or 650 ft. below datum which is taken at the shop floor of the company's mill.

Ore above level B has been practically worked out. The main oreshoots are fully developed between levels B and C and are partially stoped. Between C and D levels the oreshoots are partially developed, but no stopes have been started. Level D is the lowest level opened. During the year 9,294 ft. of workings was driven; 83 ft. of shaft sinking, 1,389 ft. of drainage tunnel (finished and connecting with level C); 3,162 ft. drifting on C and 2,700 ft. of drifting on D levels.

Ore reserves at the beginning of 1922 were 142,410 tons, of the average value of $20.30 per ton (total gross value of $2,891,062); at the end of 1922, 316,000 tons of ore,

averaging $18.05 and having a total gross value of $5,703,-820. In 1922, 46,244 tons of average value of $20.38, or total gross value of $942,598.21 was milled; total recovery was $865,521.28 in gold and silver; extraction, 91.8 per cent. To development work, 219,934 tons, of average value of $17.07, or a total gross value of $3,755,356, was therefore credited. As $7 per ton gross value has been to date the limit of payable ore, no ore of less than this grade was included in the estimates. The capacity of the mill is being increased to 200 tons per day. Improved treatment by reason of the changes being made will lower the limit of payable ore to $6 per ton. The estimated production of 1923 is between $900,000 and $1,000,000, the grade of ore that it is expected to mine will be below the average given for that of the reserves.

The Mining Corporation of Canada, Ltd.

Silver; Cobalt, Ontario

A report of the operations of the Mining Corporation of Canada, Ltd., for 1922 states that there was produced from the older mines of the corporation 338,638.32 oz. of silver; from the Buffalo mine of the General Examining & Developing Co., Ltd. 965,036.62 oz.; and from the Cobalt Lake tailing plant 158,593.65 oz.

The small amount of actual ore broken in the Cobalt mines, together with the uncertain nature of ore in place, would indicate the complete exhaustion of these properties some time during this year.

During the year, the Buffalo mine of the General Examining & Developing Co., Ltd., made a net profit of $297,-804.56, and, continuing the conservative policy started over a year ago, the General Examining & Developing Co., Ltd., turned over to the corporation cash assets to the amount of $300,000.

The last two years has been a period of anxiety. A gap was inevitable between the exhaustion of the Cobalt properties and the future profits of the Flin Flon venture. The company hopes a bridge for this gap has been found in its Lorrain mines. Operating account is as follows:

To		
Mining cost		$83,316.64
Milling and reduction		149,273.63
Freight, transportation, smelting, and realization		27,456.60
Administration and general		19,827.12
Special expenditure		5,991.62
Profit at mines		101,958.15
		$387,823.76
By		
Values		$354,746.00
Other income		4,379.04
Dividend from Cobalt Reduction Co., Ltd.		28,698.72
		$387,823.76

PROFIT-AND-LOSS ACCOUNT

To head office expenses	$95,183.77	By profit at mines	$101,958.15
		Interest, exchange and profit on investments	35,190.77
Balance down	41,965.15		
	$137,148.92		$137,148.92
Balance to balance sheet	$2,788,159.28	Balance last year	$2,746,194.13
		Net profit	41,965.15
	$2,788,159.28		$2,788,159.28

Balance sheet as of Dec. 31, 1922, is given as follows:

LIABILITIES

Accounts payable		$70,372.01
Dividends unclaimed		21,908.27
Profit-and-loss account (balance at credit)		2,788,159.28
Capital stock:		
1,660,050 shares at $5 each, fully paid		8,300,250.00
		$11,180,689.56

ASSETS

Cash in bank and on hand		$433,237.71
Due by smelter	$81,959.87	
Ore in transit and on hand	34,473.95	
		116,433.82
War loans (Canadian) and bonds		66,840.30
Investments in South Lorrain, property and advances		419,275.24
Loans, secured		70,683.98
Accounts receivable		13,117.27
Stores and prepaid expense		13,287.89
Due by Cobalt Reduction Co., Ltd.	113,328.36	
Shares, Cobalt Reduction Co., Ltd.	249,083.34	362,411.70
Fixed assets, buildings and equipment		249,778.99
Flin Flon and optioned properties		1,096,637.37
General Examining & Developing Co., Ltd., shares		499,995.00
Russian and Asiatic prospects		285,866.68
Mining rights		7,553,123.61
		$11,180,689.56

Hollinger Consolidated Gold Mines, Ltd.

Gold; Ontario

A report of the operations of the Hollinger Consolidated Gold Mines, Ltd., for 1922 shows a net profit of $5,146,690. Profit-and-loss statement follows:

Sources of 1922 income from		
gold and silver produced		$12,274,114.77
Premium on U. S. Exchange		167,901.65
Interest on investments and other income		382,591.83
		$12,824,608.25
Disposal of 1922 income		
General charges	$522,136.33	
Mining charges	4,071,583.79	
Milling charges	1,752,284.01	
		6,346,004.13
Operating profit		$6,478,604.12
Deduct, taxes	$518,223.67	
Depreciation		
Plant	787,999.95	
Investments in other companies and properties written down	18,115.23	
Donations	7,575.00	
		1,331,913.85
Net profit		$5,146,690.27
Paid out in dividends		3,198,000.00
Added to surplus		$1,948,690.27

Balance sheet as of Dec. 31, 1922, is given as follows:

ASSETS

Mining properties		$21,150,244.17	
Schumacher Gold Mines, Ltd.		1,343,541.00	
			$22,493,785.17
Plant. Brought forward from 1921		$1,355,302.29	
Additions during 1922		781,941.02	
Schumacher Gold Mines, Ltd.		288,135.23	
		$2,425,378.54	
Less depreciation for 1922		787,999.95	
			$1,637,378.59
Investments in other companies and properties			
Brought forward from 1921		$44,922.50	
Additions during 1922		20,278.18	
		$65,200.68	
Less written off in 1922			
Shiningtree operations abandoned	$6,966.53		
Long Sault power project abandoned	7,727.17		
Quinze River power project	2,471.95		
		17,165.65	
		$48,035.03	
Less depreciation for 1922		949.58	
			47,085.45
			$24,178,249.21
Current			
Accounts receivable		$31,819.23	
Call loans		703,479.90	
Materials and supplies on hand		636,887.66	
Cash on hand—in bank		929,757.05	
Investments, interest, and miscellaneous		5,074,318.68	7,376,262.62
Bullion in transit and solutions on hand			559,717.12
			$32,114,228.95

LIABILITIES

Capital stock			
Authorized		$25,000,000.00	
In treasury		400,000.00	
			$24,600,000.00
Current liabilities			
Wages unpaid		137,125.95	
Accounts payable		278,883.23	
			416,009.18
Schumacher Gold Mines, Ltd.			888,750.00
Reserve for Dominion of Canada 1922 taxes			300,000.00
Surplus			
Balance of account from 1921		$3,960,779.50	
Profits from Jan. 1 to Dec. 31, 1922		6,013,340.21	
		$9,974,119.71	
Less dividends	$3,198,000.00		
Plant depreciation	787,999.95		
Donations	7,575.00		
Balance 1919, 1920 and 1921 taxes paid, in 1922	52,959.76		
Investments in other companies and properties written down	18,115.23		
		4,064,649.94	
Net surplus carried forward			$5,909,469.77
			$32,114,228.95

Ore reserves amount to 1,321,934 tons valued at $13.50 per ton; 1,992,192 tons at $8.96 and 76,619 tons at $7.32 per ton.

MINING STOCKS

Week Ended March 3, 1923

Stock	Exch.	High	Low	Last		Last Div.
COPPER						
Ahmeek	Boston	87	72	85	Dec. '22, Q	$1.00
Alaska-Br. Col.	N. Y. Curb	2⅛	2	2⅛	.....	....
Allouez	Boston	34	26	33	Mar. '19	1.00
Anaconda	New York	53	50⅛	52⅞	Nov. '20, Q	1.00
Arcadian Consol.	Boston	4	3	4	.....	....
Ariz. Com'l.	Boston	14⅛	11⅛	13⅛	Oct. '18, Q	0.50
Bingham Mines	Boston	19	18	18⅛	Sept. '19, Q	0.25
Calumet & Arizona	Boston	66	61	65⅛	Dec. '22, Q	0.50
Calumet & Hecla	Boston	420	357	395	Dec. '22, Q	5.00
Canada Copper	N. Y. Curb	*9	*3	*5	.....	....
Centennial	Boston	15	9⅛	15	Dec. '18, SA	1.00
Cerro de Pasco	New York	49⅜	47	48⅛	Mar. '21, Q	0.50
Chile Copper	New York	30⅜	29	30	.....	....
Chino	New York	31⅛	28⅛	31⅛	Sept. '20, Q	0.37
Copper Range	Boston	46⅜	42⅛	46	Mar. '22, Q	1.00
Crystal Copper	Boston Curb	1⅛	1	1⅛	.....	....
Davis-Daly	Boston	4⅜	4⅛	4⅛	Mar. '20, Q	0.25
East Butte	Boston	11⅛	10	11⅛	Dec. '19, A	0.50
First National	Boston Curb	80	50	75	Feb. '19, SA	0.15
Franklin	Boston	2⅛	2 1/16	2⅛	.....	....
Gadsden Copper	N. Y. Curb	*90	*80	*90	.....	....
Granby Consol.	New York	30⅛	28⅛	30	May '19, Q	1.25
Greene-Cananea	New York	33⅛	30	33⅜	Nov. '20, Q	0.50
Hancock	Boston	4	2⅛	3⅛	.....	....
Howe Sound	N. Y. Curb	4⅛	3⅛	4	Jan '21, Q	0.05
Inspiration Consol.	New York	42⅜	40⅛	42⅛	Oct. '20, Q	1.00
Iron Cap	Boston Curb	8	6⅞	7	Sept. '20, K	0.25
Isle Royale	Boston	33⅛	27⅛	33	Dec. '22, K	0.50
Kennecott	New York	45	41⅛	44⅛	Jan. '23, K	0.75
Keweenaw	Boston	1⅛	1⅛	1⅛	.....	....
Lake Copper	Boston	5⅛	4⅛	5	.....	....
Magma Copper	New York	38	35⅛	37⅛	Jan. '19, Q	0.50
Mason Valley	N. Y. Curb	2⅛	2	2⅛	.....	....
Mass Consolidated	Boston	4⅛	2⅛	4⅛	Nov. '17, Q	1.00
Miami Copper	New York	30⅛	28⅛	30⅛	Feb. '23, Q	0.50
Michigan	Boston	3⅛	2⅛	3	.....	....
Mohawk	Boston	70	61	68	Nov. '22, Q	1.00
Mother Lode Coa.	New York	13⅛	12⅛	13	Dec. '22, K	0.50
Nevada Consol.	New York	17⅛	16⅛	17⅛	Sept. '20, Q	0.25
New Cornelia	Boston	24⅛	20⅛	24	Feb. '23, Q	0.25
North Butte	Boston	12⅛	10⅞	12⅛	Oct. '18, Q	0.25
Ohio Copper	N. Y. Curb	*79	*54	*79	.....	....
Old Dominion	Boston	32⅛	26⅛	31	Dec. '18, Q	1.00
Osceola	Boston	46	38⅛	44⅛	Dec. '22, K	1.00
Phelps Dodge	Open Mar.	†180	†170	....	Jan. '23, Q	1.00
Quincy	Boston	50	43⅜	49	Mar. '20, Q	1.00
Ray Consolidated	New York	17⅛	15⅜	17	Dec. '20, Q	0.25
Ray Hercules	N. Y. Curb	1⅜	1⅛	1⅜	.....	....
St. Mary's Min. Ld.	Boston	53⅛	47	53	Apr. '22, K	2.00
Seneca Copper	Boston	12⅜	11	12⅛	.....	....
Shannon	Boston	1	*80	1	Nov. '17, Q	0.25
Shattuck Arizona	New York	10⅞	10⅛	10⅜	Jan. '20, Q	0.25
South Lake	Boston	†1	†*60	*50	.....	....
Superior & Boston	Boston	3 7/16	2⅛	2⅛	.....	....
Tenn. C. & C. cfs.	New York	12⅜	12	12⅛	May '18, I	1.00
Tuolumne	Boston	*55	*47	*52	May '13,	0.10
United Verde Ex.	N. Y. Curb	33	30	33	Nov. '22, Q	0.25
Utah Consol.	Boston	2⅜	1⅛	2⅛	Sept '18,	0.25
Utah Copper	New York	76	68⅛	76	Dec. '22, Q	0.50
Utah Metal & T.	Boston	1⅛	1⅛	1⅛	Dec. '17,	0.30
Victoria	Boston	2⅛	1⅛	2⅛	.....	....
Winona	Boston	1⅛	1	1⅛	.....	....
Wolverine	Boston	13	10	12	.....	....
NICKEL-COPPER						
Internat. Nickel	New York	16⅛	15	16	Mar. '19,	0.50
Internat. Nickel, pfd.	New York	78	77	78	Feb. '23, Q	1.50
LEAD						
Carnegie Lead & Zinc	Pittsburgh	5⅛	5⅛	5⅛	.....	....
National Lead	New York	133⅛	128	133⅛	Dec. '22, Q	2.00
National Lead, pfd.	New York	113⅛	113	113⅛	Dec. '22, Q,	1.75
St. Joseph Lead	New York	21⅛	20	21⅛	Dec. '22, Q, X	0.50
ZINC						
Am. Z. L. & S.	New York	19⅛	17⅜	18⅛	May '20,	1.00
Am. Z. L. & S. pfd.	New York	58⅛	55⅜	57⅜	Nov. '20, Q	1.50
Butte C. & Z.	New York	11⅛	11	11	Mar. '23,	0.50
Butte & Superior	New York	37⅜	33	36⅛	Dec. '22,	0.50
Callahan Zn-Ld	New York	11⅛	10⅞	11⅛	Dec. '20, Q	0.50
New Jersey Zn.	N. Y. Curb	178⅛	176	177	Feb. '23, Q	2.00
Yellow Pine	Los Angeles	*75	*71	*75	Sept. '20, Q	0.03
SILVER						
Batopilas Mining	New York	⅜	⅛	⅛	Dec. '07, I	0.12½
Beaver Consol.	Toronto	43	40⅛	41⅛	May '20, K	0.03
Candelaria	N. Y. Curb	*26	*22	*25	.....	....
Coniagas	Toronto	2.15	2.15	2.15	May '21, Q	0.12½
Crown Reserve	Toronto	45	36⅛	43⅛	Jan. '17,	0.05
Hilltop-Nev.	N. Y. Curb.	1⅛	1 1/16	1⅛	.....	....
Kerr Lake	N. Y. Curb	3	3	3	Jan. '23, Q	0.12½
La Rose	Toronto	*41⅛	*37	*41	Apr. '22,	0.10
McKinley-Dar.-Sav.	Toronto	*21⅛	*19⅛	*21⅛	Oct. '20, Q	0.03
Mining Corp. Can.	Toronto	1.60	1.30	1.60	Sept. '20, Q	0.12½
Nipissing	N. Y. Curb	6⅛	6	6⅛	Jan. '23, Q, X	0.60
Ontario Silver	New York	5⅜	5⅛	5⅛	Jan. '19, Q	0.50
Temiskaming	Toronto	*32	*31	*32	Jan. '20, K	0.04
Trethewey	Toronto	*5	*4	*5	Jan. '19,	0.05

Stock	Exch.	High	Low	Last		Last Div.
GOLD						
Alaska Gold	New York	⅛	⅛	⅛	.....	....
Alaska Juneau	New York	1⅛	1⅛	1⅛	.....	....
Atlas	Toronto	14½	12½	12½	.....	....
Carson Hill	Boston	....	....	9⅛	.....	....
Cresson Consol. G.	N. Y. Curb	2⅛	2⅛	2⅛	Jan. '23 Q.	0.10
Dome Mines	New York	41⅛	40⅛	41⅛	Jan. '23, Q	0.50
Golden Cycle	Colo. Springs	1.03	1.02	1.02	Dec. '22, Q	0.02
Hollinger Consol.	Toronto	13.75	13.35	13.75	Feb. '23, M	0.05
Homestake Mining	New York	70	68⅛	68⅛	Feb. '23, M	0.50
Keora	Toronto	*9⅛	*9	*9⅛	.....	....
Kirkland Lake	Toronto	*53	*51⅛	*53	.....	....
Lake Shor e	Toronto	3.65	3.57	3.65	Nov. '22, Q	0.02
McIntyre- Porcupine	Toronto	19.00	18.70	18.80	Jan. '23, K	0.25
Porcupine Crown	Toronto	*14	*13	*14	July '17,	0.03
Portland	Colo. Springs	*38	*37	*38	Oct. '20, Q	0.01
Schumacher	Toronto	*30	*30	*30	.....	..
Teck Hughes	Toronto	*91	*88	*91	.....	....
Tom Reed	Los Angeles	1.14½	1.08	1.12	Dec. '19,	0.02
United Eastern	N. Y. Curb	2 1/16	2	2⅛	Jan. '23, Q	0.15
Vipond Cons.	Toronto	*76	*75	*75	.....	..
White Caps Mining	N. Y. Curb	*8	*8	*8	.....	....
Wright-Hargreaves	Toronto	3.33	3.27	3.27	Jan. '23	0.02½
Yukon Gold	N. Y. Curb	*85	*85	*85	June '18,	0.02½
GOLD AND SILVER						
Boston-Mont. Corp.	N. Y. Curb	*14	*10	*10	.....	....
Cons. Virginia	San Francisco	*10⅛	*10⅛	*10⅛	.....	....
Continental Mines	N. Y. Curb	5⅛	5⅛	5⅛	.....	....
Dolores Esperanza	N. Y. Curb	2	1⅞	2⅛	Jan. '23	2.50
Tonopah Belmont	N. Y. Curb	....	....	1⅛	Jan. '23, Q	0.05
Tonopah Divide	N. Y. Curb	*74	*68	*74	.....	....
Tonopah Extension	N. Y. Curb	3⅛	2⅛	2 1/16	Jan. '23, Q	0.05
Tonopah Mining	N. Y. Curb	2 1/16	2	2	Jan. '23, SA,	0.15
West End Consol.	N. Y. Curb	1 1/16	1⅛	1⅛	Dec. '22, Q	0.05
SILVER-LEAD						
Caledonia Mng.	N. Y. Curb	*8	*7	*8	Jan. '21, M	0.01
Cardiff M. & M.	Salt Lake	*31	*31	*31	Dec. '20,	0.15
Chief Consol.	Boston Curb	4⅛	4⅛	4⅛	Feb. '23, Q	0.10
Columbus Rexall	Salt Lake	*20⅛	*18⅛	*20⅛	Aug. '22,	0.03
Consol. M. & S.	Montreal	28	28	28	Oct. '20, Q	0.62½
Eagle & Blue Bell	Boston Curb	2⅛	2⅛	2⅛	Nov. '22, K	0.05
Federal M. & S.	New York	12	11	11	Jan '09,	1.50
Federal M. & S. pfd.	New York	54⅛	52	53⅛	Dec. '22, Q	1.25
Florence Silver	Spokane	*38	*38	*38	Apr. '19,	0.01½
Hecla Mining	N. Y. Curb	9⅛	8⅛	8⅛	Dec. '22, Q, X	0.50
Iron Blossom Con.	N. Y. Curb	*31	*31	*31	Apr. '22, Q	0.02½
Marsh Mines	N. Y. Curb	*8	*8	*8	June '21, I	0.02
Park City	Salt Lake	3.50	3.40	3.50	Jan. '23,	0.10
Prince Consol.	Salt Lake	*9⅜	*8⅛	*9⅜	Nov. '17,	0.02½
Silversmith	Spokane	*49	*47	*47	Oct. '22,	0.01
Simon Silver Lead	N. Y. Curb	*32	*29	*30	.....	....
Tamarack-Custer	Spokane	1⅛	1⅛	1⅛	Jan. '21, K	0.04
Tintic Standard	Salt Lake	3.00	2.62½	2.97½	Dec. '22, Q, X	0.10
Utah-Apex	Boston	5	4	4⅛	Nov. '20, K	0.25
IRON						
Bethlehem Steel "B"	New York	71⅛	65½	71⅛	Jan. '23	0.25
Char. Iron	Detroit	2½	2½	2½	.....	....
Char. Iron, pfd	Detroit	....	....	2⅛	.....	....
Colorado Fuel & Iron	New York	30½	28⅛	30½	May '21	0.75
Col. Fuel & Iron, pfd.	New York	....	....	105	Feb. '23 Q	2.00
Gt. North'n Iron Ore	New York	35⅛	33⅛	35⅛	Dec. '22	1.00
Inland Steel	N. Y. Curb	46⅛	46⅛	46⅛	Mar. '23	0.25
Mesabi Iron	N. Y. Curb	11⅛	10⅛	11⅛	.....	....
Replogle Steel	New York	29¼	27⅛	29	.....	....
Republic I. & S.	New York	61⅛	55⅛	60⅛	May '21	1.50
Republic I. S., pfd.	New York	94⅛	93⅜	94⅛	Jan. '22	1.75
Sloss-Sheffield S. & I.	New York	54⅛	49	53⅛	Feb. '21	1.50
U. S. Steel	New York	108⅜	106½	108⅜	Dec. '22	1.25
U. S. Steel, pfd.	New York	121½	120	120⅜	Feb. '23	1.75
Virginia I. C. & C.	New York	64	63	63½	Jan. '22	1.50
Virginia I.C.&C.,pfd.	New York	....	....	80	Jan '23	2.50
VANADIUM						
Vanadium Corp.	New York	43¼	46⅛	42⅞	Jan. '21, Q	1.00
ASBESTOS						
Asbestos Corp.	Montreal	71⅛	69	70⅜	Oct. '22, Q	1.50
Asbestos Corp. pfd.	Montreal	88⅛	88⅛	88⅛	Oct. '22, Q	1.75
SULPHUR						
Freeport Texas	New York	21	19	20⅛	Nov. '19, Q	1.00
Texas Gulf	New York	63⅛	60⅜	61⅜	Dec. '22, QX	2.00
PLATINUM						
So. Am. Gold & P.	N. Y. Curb	4⅜	4⅛	4⅛	.....	....
MINING, SMELTING AND REFINING						
Amer. Metal	New York	55⅛	51⅛	55	Mar. '23, Q	0.75
Amer. Metal pfd.	New York	116	115	116	Mar. '23, Q	1.75
Amer. Sm. & Ref.	New York	69⅛	62	68⅜	Mar. '21, Q	1.00
Amer. Sm.& Ref. pfd	New York	101⅜	100⅛	101⅛	Mar. '23 Q	1.75
U. S. Sm. R. & M.	New York	43⅛	39	43	Jan. '21, Q	0.50
U.S. Sm.R.& M. pfd.	New York	46⅛	46	46⅛	Jan. '23 Q	0.87½

*Cents per share. †Bid or asked. Q, Quarterly. SA, Semi-annually. M, Monthly. K, Irregular. I, Initial. X, Includes extra.

Toronto quotations courtesy Arthur E. Moysey; Spokane, Pohlman Investment Co.; Salt Lake, Stock and Mining Exchange; Los Angeles, Chamber of Mines and Oil; Colorado Springs, Colorado Springs Stock Exchange.

Current Prices of Mine Materials and Supplies

RISE AND FALL OF THE MARKET

Advances—Steel structurals up to $2.25@$2.40, as against $2.10 per 100 lb., f.o.b. Pittsburgh, one month ago. Some mills place a minimum of $2.25 on shapes and plates, others, $2.35; as high as $2.50 having been quoted on small lots. Steel sheets, at Pittsburgh mill, up 10c. on black and 25c. per 100 lb. on galvanized, since last month; also higher in New York and Chicago warehouses. Mill-price of spikes and track bolts slightly higher. Wrought-iron pipe discounts reduced two points on black and six on galvanized. Cast-iron pipe up $1 per ton in San Francisco and Chicago warehouses; higher in St. Louis. Birmingham mill base, however, unchanged during month. Hollow tile advanced in New York and at Perth Amboy factory. Pine timbers up $2 in New York and $4 in Chicago; Douglas fir $3 per M. ft. higher in San Francisco. Wire nails higher in Pittsburgh and San Francisco. Portland cement up 10c. in New York and Cleveland; 15c. per bbl. in Chicago. Linseed oil rose 5c. per gal. in New York and Chicago since February. Manila rope, ¾-in., up ¼c. in New Orleans and 1c. per lb. in N. Y.

Declines—Standard section angle bars down slightly at Pittsburgh mill. Cast-iron pipe, 6-in., 80c. per ton lower in New York, than month ago. Wire and cut nails cheaper in Dallas and St. Louis.

SHEETS—Quotations are per 100 lb. in various cities from warehouse also the base quotations from mill:

Blue Annealed	Pittsburgh, Large Mill Lots	St. Louis	Chicago	San Francisco	New York
No. 10	$2.50@2.75	$4.10	$4.00	$4.35	$4.34
Black No. 28	3.35@3.60	4.80	4.85	5.90	4.90
Galvanized No. 28	4.35@4.75	5.85	5.85	6.75	5.90

STEEL RAILS—The following quotations are per ton f.o.b. Pittsburgh and Chicago for carload or larger lots:

	Pittsburgh Current	Pittsburgh One Year Ago	Birmingham	Chicago
Standard bessemer rails	$43.00	$40.00	.....	$43.00
Standard openhearth rails	43.00	40.00	$43.00	43.00

TRACK SUPPLIES—The following prices are base per 100 lb. f.o.b. Pittsburgh for carload lots, together with the warehouse prices at the places named:

	Pittsburgh Current	Pittsburgh One Year Ago	Chicago	St. Louis	San Francisco	Birmingham
Standard spikes, ⅝-in. and larger	$2.90	$2.20@2.25	$3.00	$3.60	$4.45	$3.29
Track bolts	3.85@4.50	3.25	4.00	4.70	5.45	4.29
Standard section angle bars	2.75	2.40	2.75	3.45	4.10	2.94

STRUCTURAL MATERIAL—Following are base prices f.o.b. mill, Pittsburgh and Birmingham together with quotations per 100 lb. from warehouses at places named:

	Pittsburgh, Mill	Birmingham Mill	New York	Dallas	St. Louis	Chicago	San Francisco
Beams, 3 to 15 in.	$2.25@2.35	$2.40	$3.44	$4.40	$3.00	$3.05	$3.35
Channel, 3 to 15 in.	2.25@2.35	2.40	3.44	4.40	3.00	3.05	3.35
Angles, 3 to 6 in., ¼ in. thick	2.25@2.35	2.40	3.44	4.40	3.00	3.05	3.35
Tees, 3 in. and larger	2.25@2.35	2.40	3.44	4.40	3.00	3.05	3.35
Plates	2.25@2.35	2.40	3.44	4.50	3.00	3.05	3.45

WIRE ROPE—Discounts from list price, f.o.b. New York and east of Missouri River, on regular grades of bright and galvanized are as follows:

Hercules red strand, all constructions	25%
Cast steel round strand rope	27½%
Galvanized steel rigging and guy rope	12½%
Round strand iron and iron tiller	10%
Plow steel round strand rope	40%
Special steel round strand rope	35%

	New York	Cleveland	Chicago
Drill Rod (from list)	55@60%	40%@55%	50%

WROUGHT PIPE—The following discounts are to jobbers for carload lots on the latest Pittsburgh basing card:

	Inches	Steel Black	Galv.	Inches	Iron Black	Galv.
BUTT WELD—	..1 to 3	64	52½	¾ to 1½	30	13
LAP WELD—	2½ to 6	61	49½	4½ to 6	28	13

STEEL PIPE—From warehouses at the places named the following discounts hold for steel pipe:

	Black New York	Black Chicago	Black St. Louis
2½ to 6 in. lap welded	51%	59½%	54%

CAST-IRON PIPE—The following are prices per net ton for carload lots:

	New York Current	New York One Year Ago	Birmingham	Chicago	St. Louis	San Francisco
6 in. and over	$56.50	$47.30–48.30	$43.00	$53.20	50.60	$57.00

Nuts—	New York	Cleveland	Chicago
Hot pressed, sq., per 100 lb. Off list	$1.00	$3.00	$4.00
Cold punched, sq., per 100 lb. Off list	1.00	3.00	4.00

HOLLOW TILE—Price per block in carload lots to contractor for hollow building tile.

	New York Current on Trucks	New York One Year Ago	Chicago	Philadelphia	St. Louis	San Francisco	Perth Amboy N. J., Factory
4x12x12	$0.1314	$0.1112	$0.0674	$0.12	$0.088	$0.108	.....
6x12x12	.1971	.1667	.0926	.....	.11	.156	.....
8x12x12	.2463	.2084	.1263	.1875	.15	.244	$0.2362

MACHINE BOLTS—	New York	Cleveland	Chicago
1½ and 1½x3 in. up to 12 in.	20 %	50%	50%
Button head bolts, with hex. nuts	15 %	$3.90 net	.....

LUMBER—Prices of rough Douglas Fir No. 1 common, in carload lots to dealers, in yards at San Francisco. To contractors, $2 per M. ft. additional.

	6-8 and 12 Ft.	10-16-18 and 20 Ft.	22 and 24 Ft.	25 to 32 Ft.
3x3 and 4	$38.00	$39.00	$40.00	$43.00
3x6 and 8	38.00	39.00	40.00	43.00
4x4-6 and 8	38.00	39.00	40.00	43.00

Wholesale prices to dealers of long leaf yellow pine. To contractors in New York City, delivered from lighters or cars to job, $5 additional.

	New York 20 Ft. and Under	New York 22-24 Ft.	Chicago 20 Ft. and Under	Chicago 22-24 Ft.
3x4 to 8x8	$50.00	$51.00	$54.50	$56.50
3x10 to 10x10	54.00	55.00	57.50	59.50
3x12 to 12x12	58.00	59.00	60.50	62.50

Other Cities	8 x8-In. x 20 Ft. and Under Pine	Fir	Hemlock	Spruce	12 x 12-In. 20 Ft. and Under Pine	Fir
Boston	$67.00	$125.00	$65.00	$65.00	$90.00	$140.00
Cincinnati	45.00	51.50	51.50	51.50	45.00	53.50
Montreal	50.00	50.00	40.00	38.00	95.00	90.00
Denver	.....	41.00	44.00	41.00	.....	51.00
Minneapolis	46.50	43.75	41.00	.....	49.00	44.75
Kansas City	43.75	47.00	47.00	49.50	56.75	.....
Birmingham	32.00	.....	.....	.....	40.00	.....

NAILS—The following quotations are per keg from warehouse:

	Pittsburgh, Mill	Chicago	San Francisco	Dallas	St. Louis	Montreal
Wire	$2.80@3.00	$3.45	$4.10	$4.25	$3.14	$4.95
Cut	3.20@3.25	5.50	5.80	5.75	3.24	5.00

PORTLAND CEMENT—Prices to contractors per bbl. in carload lots *without bags*. Cash discount not deducted.

	Current	One Month Ago	One Year Ago
NewYork, del. by truck	$2.70@2.80	$2.60@2.70	2.30
Chicago, f.o.b.	2.20	2.05	1.94
Cleveland, f.o.b.	2.46	2.36	2.26

LIME—Warehouse prices:

	Hydrated, per Ton Finishing	Common	Lump, per Barrel Finishing	280-lb.net Common
New York	$16.80@$17.10	$13.10	$3.75	$3.00@$3.25
San Francisco	22.00	16.00	....	(180-lb net) 1.75

LINSEED OIL—These prices are per gallon:

	New York Current	New York One Year Ago	Chicago Current	Chicago One Year Ago
Raw in barrel (5 bbl. lots)	$1.01	$0.87	$1.07	$0.91

WHITE AND RED LEAD—Base price in cents per pound:

	Red Current Dry	Red Current In Oil	Red 1 Year Ago Dry	Red 1 Year Ago In Oil	White Current Dry or In Oil	White Yr. Ago Dry or In Oil
100-lb. keg	14.25	15.75	12.25	13.75	14.25	12.25
25 and 50-lb. kegs	14.50	16.00	12.50	14.00	14.50	12.50

HOSE—

Fire Underwriters' 2½-in. coupled	50-Ft. Lengths 50c per ft.
Air ¾-in., 3 ply per ft.	First Grade $0.31 / Second Grade $0.22½

Steam—Discounts from List
First grade.... 40-10-5% Second grade.....50% Third grade.....50-10%

RUBBER BELTING—The following discounts from list apply to transmission rubber and duck belting:
Competition..... 65% Best grade..... 60%

LEATHER BELTING—List price per ply, 12-in. wide, per lin. ft. $2.88.

Grade	Discount from list
Medium	30–10%
Heavy	20–5–2½%

RAWHIDE LACING—For cut, best grade, 40%, 2nd grade, 50%. For laces in sides, best, 48c. per sq.ft.; 2nd, 43c. Semi-tanned: cut, 40%; sides, 48c. per sq.ft.

PACKING—Prices per pound:

Rubber and duck for low-pressure steam, ¾ in.	$0.90
Rubber sheet	.45
Rubber sheet. wire insertion	.70

MANILA ROPE—Per lb., ¾-in. and larger, 1,200-ft. coils.

Atlanta	$0.18¾	New Orleans	$0.18¼
New York	.18	Seattle	.18
Chicago	.18	San Francisco	.16

COTTON WASTE—The following prices are in cents per pound:

	New York	Cleveland	Chicago
White	10@13	15.00	11.25
Colored	7@12	12.00	8.00

EXPLOSIVES—Prices per pound of dynamite in small lots:

	Gelatin 40%	Gelatin 50%
New York	$0.27	$0.30
Minneapolis	.189	.2094
Denver	.2025	.2325
Seattle	.165	.195
Cincinnati	.22	.25
New Orleans	.235	.265
San Francisco	.1625	.1925

FLOTATION OILS—All prices are per gal., f.o.b. New York unless otherwise stated, and are based on carload lots. The oils in 50-gal. bbls., gross weight 500 lb

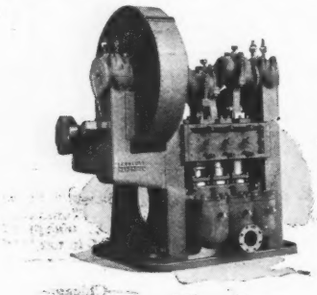
Pine oil, steam dist.	$0.90
Pine oil, pure, dest. dist.	.85
Pine tar oil, ref.	.46
Pine tar oil, crude, tank cars f.o.b. Jacksonville, Fla.	.35

NEW MACHINERY AND INVENTIONS

Triplex Mine Pumps

A triplex pump, designed expressly for mine service and embodying all the features in its construction that a real mine pump should have, is a recent addition to the line of pumping equipment manufactured by the Prescott Co., Menominee, Mich. This pump is built under the same standards that have marked the company's deep mine duplex pumps.

The outstanding features claimed in the design of the pumps are their extreme simplicity and accessibility, their reliability, and high efficiency. They are compact, taking up a minimum amount of floor space, are exceptionally strong and rugged, and are built for



Triplex Mine Pump

hard work, with a great amount of reserve power in excess of rated capacities should the occasion demand it by either changing plungers, speeds, or both.

The main frames are of great weight for pumps of this type, and have broad bearing surfaces on the foundation to absorb vibrations. The lower halves of the main bearings are cast integral with the side frames. The babbitted shells supporting the crank shaft are easily taken out for purposes of rebabbitting when necessary without removing the crank shaft or disturbing the alignment of the pump. The bearing surfaces are exceptionally large and well lubricated.

To maintain the perfect alignment necessary to the successful operation of the herringbone gear an outboard bearing is supplied. The crank shaft is cast in one piece of high-carbon electric steel. The connecting rods are of the marine type, adjustable for wear at both ends. The crossheads are of heavy proportions and the crosshead pins are of forged steel.

Only one set of gears is used to transmit the driving power, with ample ratio of reduction to permit a high-speed motor. The gearing is of the herringbone type, with double helical teeth of extremely liberal proportions. Allowance is made in the mounting of the pinion shaft bearings for a limited variation in size of pinions, thus increasing or decreasing the normal capacity of the pump. The coupling connecting motor and pinion shafts is of a flexible type and designed with a large margin of safety.

The plunger barrels, with their stuffing boxes, suction and discharge valve chambers, and pipe connections, are all included in one single casting of semi-steel. The stuffing boxes are deep and the throats of the boxes are bronze lined. The plungers are of semi-steel, single acting and outside packed. The valves are made from a special bronze or steel, depending on the size. The passage areas are exceptionally large, so as to maintain low velocities for the water. The valve seats are of special bronze, pressed into place, yet easily removable and renewable. Large suction and discharge air chambers of semi-steel are furnished when required.

Small Capacity Air Compressors

There has always been a demand for small air compressors which can be directly connected to an electric motor, but, because of the speed restrictions imposed by the limited area of the compressor valves used, such combinations heretofore have been unavailable. As a result, belt drive and, in some instances, gear drive have been employed.

The Chicago Pneumatic Tool Co. has recently developed a type of high-speed compressors which can be directly connected to electric motors or internal-combustion engines by means of flexible couplings. The compressors are of the vertical, duplex, single-acting, water-cooled type, fitted with "simplate" flat disk inlet and discharge valves. The straight and uniform lift of these valves affords a maximum of effective valve area which makes possible the speed at which these compressors operate.

These machines are built in three sizes, having piston displacements of 128, 160, and 210 cu.ft. per minute, and are suitable for working pressures of 150 lb. per square inch. The standard speed of these sizes is 600 r.p.m. Standard equipment includes hand starter for the motor and an inlet valve unloader for the compressor.

For those places where the demand for air is intermittent, the motor can be furnished with an automatic starter, which starts and stops the unit within predetermined pressure limits. When this type of starter is used, the compressor is equipped with a centrifugal unloader, which automatically relieves the compressor of its load while the motor is starting up or shutting down—a condition which is essential to the successful operation of any automatically controlled compressor. A water-control valve is also furnished, which is operated by air pressure governed by a centrifugal unloader, and as the lubrication is accomplished by a combination pump and splash system, the unit is automatic in every detail, as it accurately controls the electric current, air delivered, circulating water, and lubrication.

The arrangement of drive makes these units compact and simple and eliminates transmission losses and troubles.

INDUSTRIAL NOTES

Cloyd M. Chapman has become affiliated with Dwight P. Robinson & Co., Inc., as consulting materials engineer.

T. J. Cleary, Candler Building, Atlanta, Ga., has been appointed southern agent for the Combustion Engineering Corporation, New York.

Alfred I. Phillips, formerly associate gas engineer, National Bureau of Standards, has become associated with Arthur D. Little, Inc., as gas engineer.

Jay Harman, manager of the Mine & Smelter Supply Co. for the last two and a half years, has resigned, effective April 1, to become special sales representative for the company in the Southwest. M. H. Carpenter, manager of the San Francisco office, is promoted to the managership of the El Paso office.

Charles J. Schmid has been placed in charge of sales in Greater New York and Long Island for the Uehling Instrument Co. This company has also appointed two new agents, John E. Arnold, 15½ South 4th St., Tulsa, whose territory is the state of Oklahoma, and H. R. N. Johnson, 917-A Marquette Ave., Minneapolis, whose territory is Minnesota, North Dakota, and South Dakota.

Mitsui & Co. have been appointed exclusive representatives in Japan and China for Uehling CO_2 recording equipment and other Uehling power-plant instruments and gages. The head office of Mitsui & Co. is in Tokio, and the company's New York branch office is at 65 Broadway. The main office and factory of Uehling Instrument Co. is in Paterson, N. J.

David A. Decrow, manager of the waterworks department of the Worthington Pump & Machine Co., died on Feb. 15. He was graduated from Maine State College of Mechanic Arts of the University of Maine in 1879 and in the early 80's became associated with the Holly Manufacturing Co. as a mechanical draftsman. During his connection with that plant he became known as a waterworks engineer of national prominence and continued as a specialist in that work to the time of his death.

Compania de Minas y Fundicion de Chagres, Valparaiso, Chile, has ordered a 7-ft. diameter by 36-in. Hardinge ball mill to operate in closed circuit with a Dorr classifier for grinding copper ore for flotation. The Contact Bay Mines, Ltd., Dryden, Ont., Canada, has ordered a 6-ft Hardinge ball mill for regrinding after stamps for cyanidation. The U. S. Metals Refining Co., Carteret, N. J., has ordered a 5-ft. Hardinge ball mill for grinding coal for use in their metallurgical work. George U. Young, Phoenix, Ariz., has ordered a 6-ft. Hardinge ball mill to operate in closed circuit with a Dorr classifier for grinding copper ore for flotation.